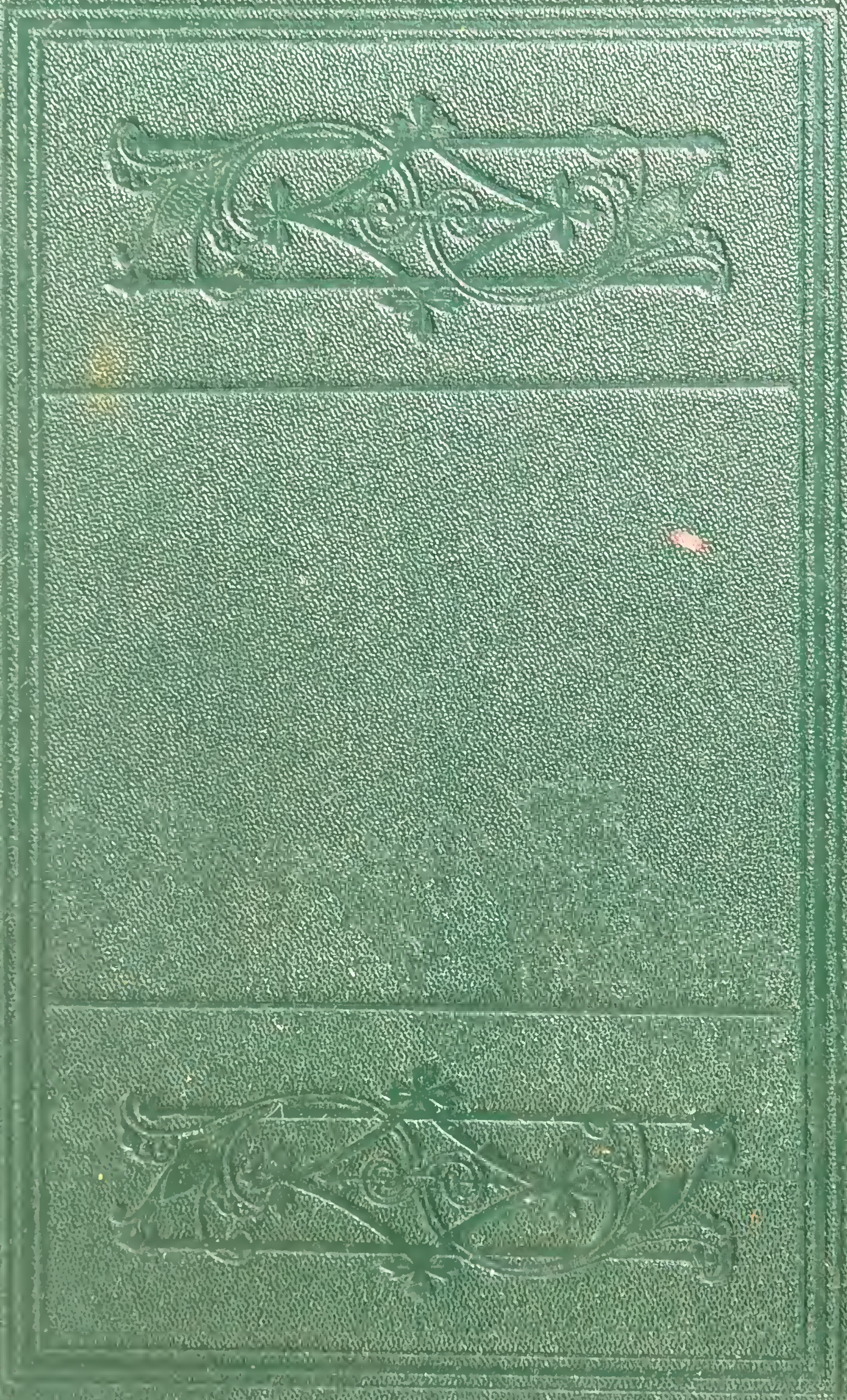

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THE STUDENT'S GUIDE
TO
MEDICAL DIAGNOSIS

BY

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FOR SICK CHILDREN

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EIGHTH EDITION

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PREFACE TO THE EIGHTH EDITION

During the twenty-eight years which have elapsed since the first appearance of this work, our knowledge concerning the nature and causation of disease has made enormous progress; and although improvements have been freely made in each fresh issue, it has long been felt that a complete revision of the volume was necessary. Accordingly for the present edition the book has been practically rewritten, and new chapters have been added upon such subjects as appeared to require separate consideration. Students when entering upon their work in the hospital seldom grasp the fact that the study of pathology forms the basis of all medical knowledge, and that without a clear conception of the post-mortem appearances presented by disease, it is impossible to understand the symptoms and physical signs observed during life. With the object of drawing attention to the all-importance of pathology in the science of diagnosis, each chapter has been prefaced by a short account of the chief diseases to which the organ under discussion is liable. Almost all the old microscopical illustrations have been discarded for others of a more modern type, and the authors would take this opportunity of expressing their obligations to Sir T. Grainger Stewart, Dr. Sims Woodhead, Dr. Coats and others, who have so kindly permitted them to copy their drawings.

29 Harley Street, W.
8 Devonshire Street, W.
July 30, 1897.

PREFACE TO THE FIRST EDITION

THE following pages were originally designed to assist the students attending the medical out-patient department of the London Hospital. The plan of instruction generally pursued there is to give to each pupil a succession of cases of a similar character. In this way, whilst one is practising the laryngoscope, another is studying auscultation, a third affections of the nervous system, and so on. After examining a case, the student is expected to state his diagnosis, and the treatment he would adopt. Although this method of *individual* instruction is doubtless more beneficial than the practice of teaching in classes, yet it necessarily involves a constant repetition on the part of the teacher. To obviate the loss of time thus incurred, I commenced to write out some general rules for diagnosis, which the student might keep beside him as a guide in his examinations. It was afterwards suggested to me to elaborate the idea, and hence the appearance of the present volume.

As the pupils have been supposed not to have yet acquired any professional knowledge, except in anatomy and physiology, all technical words have been avoided as far as practicable, and the explanations have been given in the plainest language. Drawings and diagrams have been employed whenever the nature of the subject permitted their use.

It will be observed that I have confined myself to the general rules of diagnosis, and taken but little notice of the exceptions to them that are met with in practice. This has arisen, partly from a desire to keep the volume within a moderate compass, but mainly because exceptional, or as they are generally termed, "interesting cases," form the usual texts for clinical lectures, and are therefore less required by the student in an elementary work.

29 Harley Street,
Cavendish Square,
October 1, 1869.

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GUIDE TO
MEDICAL DIAGNOSIS

CHAPTER I

INTRODUCTION

It is evident that before any one can successfully treat a disease he must be acquainted with its nature and the symptoms it produces. For instance, before prescribing for a patient suffering from pain in the head, you must ascertain from what the pain arises. It may result from the irritation of a decayed tooth, the extraction of which will give relief; or from inflammation of the periosteum, in which case you prescribe iodide of potassium with success; or from constipation of the bowels, for which a purgative only is required; or again, it may be symptomatic of an incurable disease of the brain, which might be aggravated by many of the remedies well fitted for the cure of a less formidable disorder. Diagnosis is the science which teaches us thus to distinguish one disease from another, and to trace symptoms to the causes from which they spring.

Now, diagnosis is not only valuable for treatment, but it enables you to form an accurate opinion as to the future course of a disease. For example, two persons complain of palpitation of the heart: in the one you may be able to prove that the organ is healthy in its structure, but unduly excited by disorded digestion; in the other you may find it affected with an incurable disease that may at any moment terminate the patient's life.

Before commencing to study the method of diagnosing the disease of an organ, you should acquaint yourself with its healthy structure and with the various morbid conditions to which it is liable. You will not be able to understand why the chest should give a clear sound when struck with the fingers in a patient suffering from bronchitis, and a dull sound in a case of pneumonia, unless you are aware that the resonance of a healthy chest depends on the air contained in the cells of the lung, and that these cells are unaffected in bronchitis, but are filled with fluid or solid matter in pneumonia. Refresh your memory, therefore, as to the anatomy and physiology of each organ, and carefully read over the description of the different diseases to which it is liable, before you attempt to diagnose them. You should also take every opportunity of comparing the remarks on morbid anatomy with the appearances presented to you at the post-mortem examinations, so as to make yourself familiar with the structural changes produced by disease.

Diseases are distinguished from each other, either by such alterations in the organs themselves, or their secretions, as can be ascertained by the senses of the observer (physical signs); or by changes in the functions of the parts affected (symptoms).

The physical signs of a disease are least liable to mislead us, inasmuch as in regard to them we are independent of any misconception or exaggeration on the part of the patient. Thus, when we hear a murmur in the region of the heart, or find the lung dull on percussion, or discover blood in the urine, we know there must be some abnormal condition of the heart, lung, or urinary organs. Great attention has been given of late years to this part of diagnosis, and various instruments have been invented—such as the stethoscope, laryngoscope, &c.—for the purpose of enabling us more accurately to appreciate the nature and extent of morbid changes. Care and patience are, however, required before you will be able to use these instruments with advantage, and I have therefore placed at the commencement of each chapter an account of the different methods of physical examination in use, and a few directions as to the best mode of conducting them.

Physical signs cannot be exclusively relied upon for the formation of a diagnosis : the symptoms and history of the case must be also taken into consideration. It is generally difficult for a young student to guide the patient's account of his complaint in such a way as to derive the necessary information from it. Most persons ramble in describing their symptoms, and many insist on giving their own or other persons' opinions as to the nature of their disease, instead of confining themselves to the narrative of facts. You will best overcome these difficulties by conducting your examination in a systematic manner, and by having a definite aim in every question you ask.

Students generally expect that some particular sign or symptom is sufficient to indicate each disease; but unfortunately this is not the case : on the contrary, we can rarely diagnose any morbid condition without taking into consideration a number of symptoms ; indeed, we are often forced to determine the nature of a malady by proving what it is not, rather than what it is. The plan of diagnosis adopted in the following pages has been to divide all the diseases of each organ into groups, by fixing upon some well-marked character which is possessed by some in common, but which is wanting in others; and in the same way to divide and subdivide each group. Thus, the diseases of the liver are first grouped into acute and chronic affections; the latter are again separated from each other, according as the organ is enlarged or diminished in size; and the enlargements are further subdivided into those in which there is, and into those in which there is not, either pain or tenderness on pressure.

The art of diagnosis would be readily acquired if the symptoms of a disease were always the same, but this is not so. Although, therefore, the rules laid down will generally suffice, yet you will occasionally meet with cases in which the ordinary indications are absent, or in which unusual symptoms are present. For instance, no complaint has more strongly marked signs than peritonitis—the excessive and general pain of the abdomen, the great tenderness on pressure, the rapid, wiry pulse—and yet you may meet with fatal peritonitis with scarcely any pain, or with only trifling tenderness, or with a pulse not above the normal standard.

In order to obtain the necessary skill in diagnosis, it will be requisite that you should practise the "taking of cases." You should record the symptoms and physical signs present in each case, the order in which the symptoms have been developed, the treatment adopted, the progress of the disease, and, if it terminate fatally, you should add the morbid appearances discovered after death. You will readily understand that, unless some plan is adopted, there is a great probability that you will either encumber your description of the disease with a number of unnecessary details, or overlook important facts. I have therefore added the following suggestions for a plan, which you will find useful until experience enables you to form one more suitable.

Commence with the name and address of your patient, his age, and occupation.—The age is important, because many diseases, such as cancer, are more apt to occur at certain periods of life. The nature of the occupation often gives a clue to the complaint; as, for instance, painters and other workers in lead are especially liable to colic, paralysis, gout and disease of the kidneys.

Note the position of the patient.—In pleurisy, with effusion, he usually rests on the affected side; in many diseases of the heart and lungs he prefers the sitting posture; while he lies flat and helpless in fever and other diseases attended with great weakness.

The condition of the body.—Emaciated, as in phthisis, œdematous in diseases of the heart, kidney, &c.

The state of the skin.—Yellow, as in jaundice, dry and harsh as in some diseases of the kidney, soft and perspiring in rheumatic fever, &c.

The features and expression.—Every feature may furnish important indications of disease. The arcus senilis often accompanies fatty degeneration of the heart; the nostril is dilated where the breathing is difficult; the angle of the mouth drops in palsy, it is fixed in a rigid smile in tetanus.

Whilst noting the above or any other peculiarity, avoid all unnecessary staring at your patient; educate your eye to catch the smallest deviation from the normal condition, and, at the same time, try to put the patient at his ease, so that he may be more ready and willing to answer your questions.

Next, inquire as to the manner in which the complaint commenced, whether suddenly or gradually; if it followed some other disease, such as scarlatina or rheumatic fever; or if it could be reasonably attributed to any particular cause, as exposure to cold, accidents, &c. Ascertain also if any of the patient's family have been subject to any particular malady, and if he himself generally enjoyed good health before his present illness.

The best way of commencing your inquiries as to the organ more especially affected is to ask if the patient suffers pain. If, for example, he complains of the right side of the chest, you know the lung is situated in that part, and you should inquire into the state of the functions of that organ, and ask if he suffers from cough, expectoration, dyspnœa, hæmoptysis, &c. Having determined which organ is diseased, ascertain the nature of the ailment by the rules laid down in the chapter referring to it, and note the symptoms and physical signs present in the case.

It is seldom that any organ remains long diseased without implicating others. You must therefore inquire into the manner in which the functions of all the chief organs are performed, paying more especial attention to those which are most liable to suffer along with that primarily or chiefly affected. Thus, if you should suspect lardaceous disease of the liver, you would particularly examine the state of the spleen and kidneys; or in a patient suffering from contracted kidney you would investigate the condition of the heart and retinæ.

In every case it is important for you to note the state of the pulse, respiration, tongue and appetite, together with the condition of the bowels and the amount, appearance, and chemical composition of the urine, and, when any fever is present, the temperature of the body.

Remember to commit all your observations to writing. A number of well-recorded cases is invaluable, and forms the best, "practice of physic" for your future reference and guidance. Describe only what you see and hear, do it in the simplest language, and do not allow your expressions to be influenced by any preconceived opinion as to the nature of the disease you are investigating. Be exact in your description of physical signs, and, as much as possible, employ your pencil in marking out on diagrams of the body the precise spots at which you discover any signs of disease. In this way, with ordinary industry in collecting cases, and perfect honesty in recording your observations, you cannot fail quickly to surmount the difficulties of medical diagnosis.

As inflammation is the cause of so many of the morbid changes that occur in every organ of the body, it will be necessary to make some preliminary observations in order that you may understand the microscopical appearance of the parts affected by it. This process has been carefully studied with the microscope in the transparent parts of several of the lower animals, the wing of the bat, the mesentery, tongue, or web of the frog, being generally selected for this purpose.

As soon as inflammation has been set up, either by exposure to the air or the application of some irritating substance, the smaller arteries are seen to dilate, the blood is observed to flow with increased speed through them, and the vessels become elongated and more tortuous than in their normal state. The dilatation soon extends to the neighbouring capillaries and veins, and is at first accompanied by an acceleration in the rate of their contents. After a time, the current of the blood gradually becomes slower, the retardation being first perceptible in the veins but gradually increasing, until, towards the centre of the inflamed part, obstructions may be observed in some of the capillaries, and after many oscillations to and fro, the further progress of the blood in them becomes completely arrested.

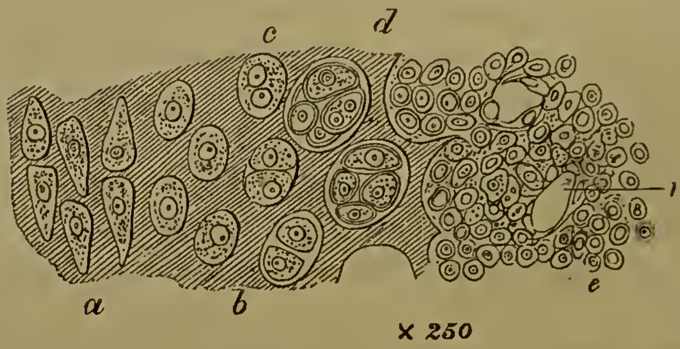
As soon as the circulation begins to slacken, an increase in the number of the white corpuscles of the blood (leucocytes) is observed to take place in many of the veins and capillaries. They collect at the sides of the dilated vessels, whilst the red corpuscles are crowded together in the centres and form a mass in which their individual shapes can no longer be recognised. The stasis of the red blood-cells usually first occurs at a bifurcation of a vessel.

You will readily understand that the liquid part of the blood (the liquor sanguinis), being subjected to the pressure of the heart behind and arrested in its onward progress, will strain through the sides of the distended vessels, and thus, in part, produce the swelling which is so constant an accompaniment of inflammation. But the white corpuscles of the blood have been also seen by the microscope to pass through the walls of the capillaries and veins into the surrounding structures, where they travel from place to place, and by their division reproduce numerous other cells like themselves. When the inflammation is intense some of the red blood-cells also escape from the vessels, but in smaller quantities than the leucocytes.

In certain tissues, and especially in those which possess few bloodvessels, the connective-tissue corpuscles increase in number and give rise to amœboid cells.

This process is shown in fig. 1, as it appears in inflamed cartilage. The multiplication of cells is most clearly seen when the skin or a mucous membrane is affected. Thus, the cellular casts of the uriniferous tubes in acute tubular nephritis, and the mucus secreted during an attack of bronchitis, afford good examples of this result of the inflammatory process.

FIG. 1.



Microscopical appearances presented by cartilage when inflamed. *a*. Normal cartilage cells. *b*, *c*, *d*. Cartilage cells increasing by division. *e*, *i*. Groups of newly formed cells. (CORNIL and RANVIER.)

CHAPTER II

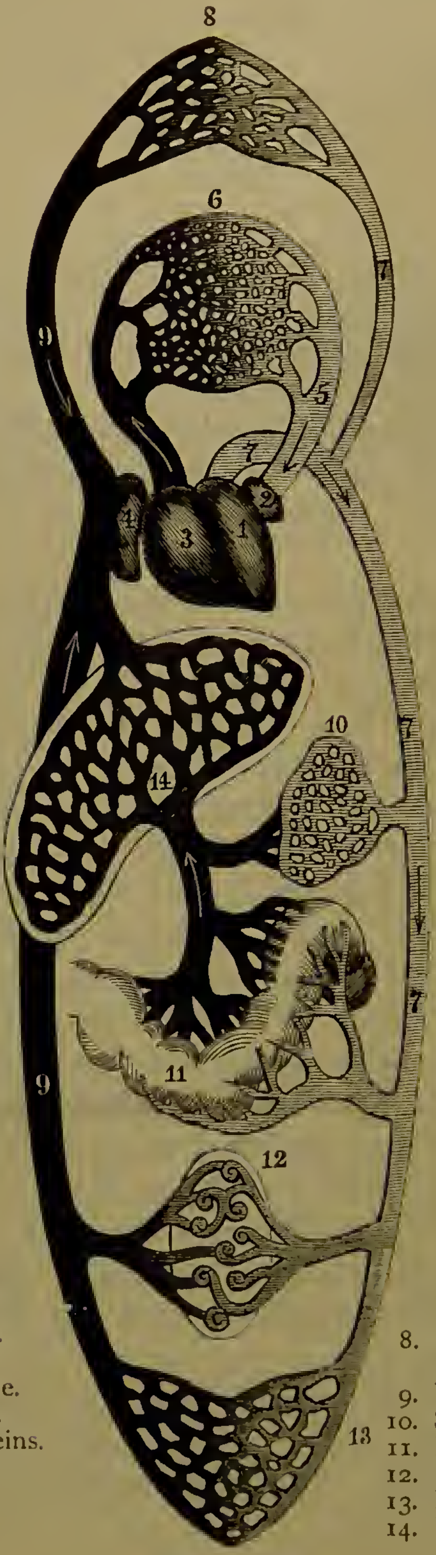
DISEASES OF THE HEART AND PERICARDIUM

The chief diseases of the heart are pericarditis, myocarditis, hydropericardium, hypertrophy, dilatation, fatty degeneration, endocarditis, diseases of the valves, and congenital malformations.

1. Pericarditis, or inflammation of the pericardium.—When death occurs at an early stage, the lining membrane is of a red colour, it is rough, pulpy, dry, thickened, and is usually covered with a thin layer of lymph. At a later period, the pericardium is distended with a turbid fluid, having flakes of lymph floating in it, whilst the surface of the serous membrane is thickly coated with lymph, which is often arranged in the form of little hillocks, or like the sand on the sea-shore, or it may be loose like thread. These appearances are produced by the motions of the heart continually separating the opposed surfaces of the serous membrane when covered with soft lymph. In mild cases the inflammation may be confined to one part of the membrane, but usually it affects both the visceral and parietal surfaces; being most intense on the former. In some instances the fluid is stained with blood or mixed with pus. Occasionally there are minute tubercles on the pericardium, when the disease is named *tubercular pericarditis.*

The first effects of pericarditis are to excite the action of the heart and to set up general fever. Where a large quantity of fluid is effused the power of the heart is

FIG. 2.—*Diagram of the Circulation.* (DALTON.)



1. Left ventricle.
2. Left auricle.
3. Right ventricle.
4. Right auricle.
5. Pulmonary veins.
6. The lungs.
7. Aorta.
8. Brain and upper extremities.
9. Venæ cavæ.
10. Spleen.
11. Intestine.
12. Kidney.
13. Lower extremities.
14. Liver.

enfeebled, and thus congestion of the lungs and other important organs is induced. After the cessation of the inflammation, we often find bands of connective tissue between the opposed surfaces of the pericardium, or its cavity is obliterated by general adhesions. Occasionally lime salts are deposited in the newly formed tissue and give rise to calcareous plates in the midst of the adhesions. (For the microscopical appearances of pericarditis, see Pleurisy.)

The chief causes of pericarditis are: (1) acute rheumatism; (2) scarlatina and other specific fevers; (3) Bright's disease; (4) pyæmia; (5) gout; (6) chorea; (7) extension of inflammation from the plura or lung; (8) injuries to the chest; (9) tubercle, cancer, or sarcoma, involving the serous membrane.

2. HYDROPERICARDIUM, or dropsy of the pericardium.—A small quantity of fluid is commonly found in the pericardium after death, but in hydropericardium the cavity is distended with fluid of an amber colour, without the lining membrane being thickened or inflamed. It chiefly arises from diseased heart or kidneys. The compression caused by the fluid, when this is present to a large amount, prevents the free action of the heart, and may thus give rise to congestion of the lungs.

3. HYPERTROPHY OF THE HEART.—There are two principal forms of cardiac hypertrophy, general and partial. The former term denotes an enlargement of the heart in all its parts, while the latter is applied to cases where one chamber only is increased in size. In general hypertrophy the heart retains its normal shape, but its various cavities are much enlarged and their walls thickened. The heart resembles that of a bullock, and is often double or treble the normal weight.

When the left ventricle is alone or chiefly hypertrophied the heart is elongated; if the right ventricle is alone hypertrophied the apex is partly or wholly formed by it, and the organ assumes a square shape. The substance of a hypertrophied heart feels hard and stiff, and the walls do not collapse when the cavities are emptied of blood. Microscopically, unless fatty degeneration is also present, the edges of the fibres are sharp and their transverse striæ well defined, but the fibres do not appear to be thicker than in their normal condition. After the disease has existed for some time the hypertrophied muscle often becomes affected with fatty degeneration.

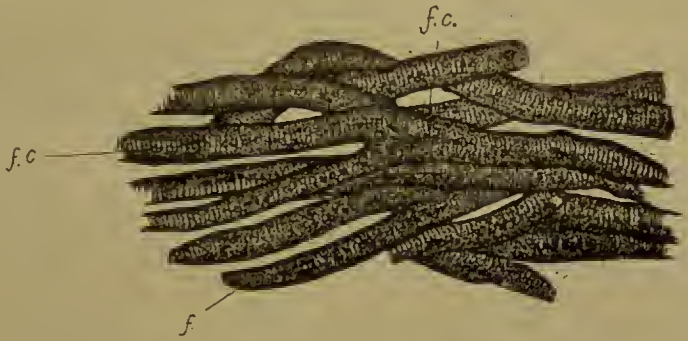
Hypertrophy is caused by any obstruction to the current of blood that is sufficient to call forth an increased action of the heart to overcome it—in other words, by overwork. Thus, the right ventricle (see 3, fig. 2) is chiefly affected in cases of emphysema, chronic bronchitis, and disease of the left side of the heart, which obstruct the free course of the blood through the lungs (6, fig. 2); the left ventricle (see 1, fig. 2) by an obstruction in the aorta (see 7, fig. 2); the left auricle (2, fig. 2) by a constriction of the mitral valve. Hypertrophy of the left ventricle may also ensue from (1) chronic Bright's disease; (2) exophthalmic goitre; (3) pregnancy; (4) physical overstrain; (5) adherent pericardium.

4. Dilatation of the Heart.—The capacity of one or more of the cavities is increased, and when the whole organ is affected it is of a square shape, and is, of course, much enlarged. Dilatation usually involves both ventricles, but is most common in the right when only one is affected. The auricles generally participate in the increase in size. Microscopically, the striæ of the fibres often appear indistinct and granular; in other cases they seem to be in a state of fatty degeneration.

Dilatation may be caused by any circumstance that prevents the complete emptying of one of the heart's cavities; thus, it affects the left ventricle when an imperfect closure of the aortic valves allows the blood which had been just expelled to flow back again into that cavity; or it may be caused by loss of tone resulting from myocarditis or general debility, or from fatty or other degenerations of the muscular structure of the heart. In consequence of the feeble contractions of the organ, the lungs and liver are apt to be congested, and dropsy is produced.

5. Fatty Degeneration.—The heart is of a pale yellow colour, it feels soft, flabby, and greasy, and tears readily. Microscopically, the fibres have lost their sharp edges and striæ, and are more or less loaded with oil; in other cases the sarcolemma is completely filled with globules of fat, the protoplasm of the contractile fibres having disappeared. (See fig. 3.) Fatty degeneration usually shows itself in streaks or patches which are most obvious beneath the endocardium. The tissue of the left ventricle and the columnæ carneæ are especially prone to exhibit signs of the disease.

Fig. 3.

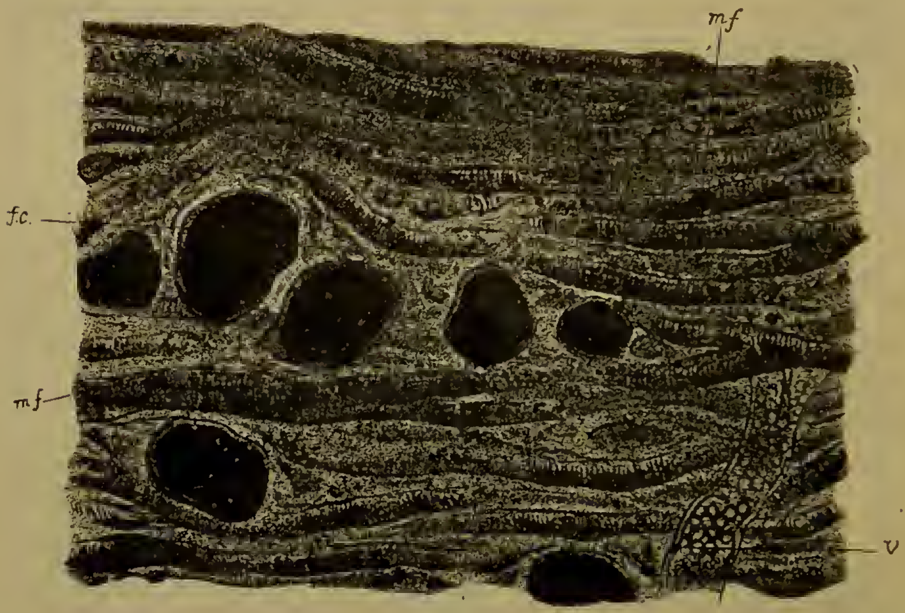


Muscular fibres in fatty degeneration of heart. *f.* Muscular fibre in which there is slight dimming of the transverse striation. *f.c.* Small fatty granules along the lines of longitudinal striation. (Dr. Sims Woodhead.)

The condition is common in persons of old or middle age, and is generally associated with other disease of the heart or coronary arteries. It may also arise from (1) acute fevers; (2) severe anæmia; (3) wasting diseases, such as cancer and phthisis; (4) poisoning by phosphorus and arsenic. Its chief effect is to diminish the energy of the heart's contraction, leading to dilatation of its cavities and subsequent failure of the circulation. Occasionally sudden death ensues from syncope or from rupture of the organ near the apex of the left ventricle.

6. Fatty Infiltration must not be confounded with fatty degeneration. It is merely a form of local obesity, and consists in the accumulation of fat below the pericardium, and between the muscular fibres (fig. 4). The contractile fibres appear to be quite healthy when viewed with the microscope, but may become attenuated by the mechanical pressure of the fat. In severe cases sudden failure of the heart is apt to occur from this cause.

Fig. 4.



Fatty infiltration of the heart. *f.c.* Large fat cells between the muscular fibres. *mf.* Muscular fibres—slight fatty degeneration. *v.* Small vessel filled with blood. (Dr. Sims Woodhead.)

7. Endocarditis, or inflammation of the endocardium.—In the early stage of this disease the lining membrane of the heart is reddened, roughened with lymph, and projections like small warts, named vegetations, are often found on the valves, being most thickly placed on the lines where the segments of the valves come into contact with each

other during their closure. In other instances the segments of the valves are united together, or the chordæ tendineæ or valves are softened and torn, or, more rarely, ulceration of the endocardium, or perforation of a valve, takes place (*ulcerative endocarditis*); or the valves are opaque, thickened, or contracted. The inflammation may be of a chronic character, and in old persons the valves of the heart often become thickened, atrophied, contracted, or calcified.

The left side of the heart is almost always the seat of endocarditis and of other forms of valvular disease, and the mitral is more frequently affected than the aortic valves.

These various morbid changes in the valves either narrow the openings of the heart, and thus obstruct the free passage of blood through them (stenosis), or they prevent the perfect closure of the valvular apparatus, and thereby allow a portion of the blood to flow back into the cavity from which it has been just expelled (regurgitation). In these ways an imperfection in a valve leads eventually to hypertrophy or dilatation of the heart.

The chief causes of endocarditis are: (1) acute rheumatism; (2) scarlatina, measles, and other infectious fevers; (3) chorea; (4) Bright's disease; (5) tuberculosis; (6) gout; (7) syphilis; (8) pyæmia.

8. MYOCARDITIS, or inflammation of the muscular substance of the heart, may be either general or local. In the former case the disease affects the entire wall of the organ, and is usually the result of some infective disorder, such as diphtheria, small-pox, or pyæmia. Local myocarditis arises from extension of inflammation from the pericardium or endocardium, or from embolism of a branch of the coronary artery. In acute cases the muscular structure is softened and engorged with blood, while in pyæmic conditions it often presents minute abscesses or hæmorrhages scattered through its substance. Microscopically, the fibres are seen to have lost their striæ, while their protoplasm is replaced by a finely granular material. In chronic myocarditis,

which is often the result of syphilis, the structure is hard and dense owing to the formation of fibrous tissue between the bundles of muscular fibres.

Inflammation of the heart diminishes the contractile power of the organ, so that its action becomes weak and irregular, and the circulation of the blood is feeble and imperfect. The disease may terminate in dilatation of the heart, or, if an abscess is present, perforation of the wall may ensue.

9. Malignant Disease of the Heart is very rare. Cancer of the œsophagus occasionally extends to the pericardium, and secondary cancerous deposits are sometimes found in the substance of the heart in the form of small, pale tumours. Sarcoma of the lung or mediastinum may also invade the heart.

10. Syphilis.—This usually occurs in the form of gummata situated in the muscular structure of the ventricles. The gumma is a dense and tough tumour, surrounded by cicatricial connective tissue, and is prone to undergo caseation in the centre. The pericardium in the vicinity of the disease is thickened and adherent.

11. Tubercle of the Heart is very rare, and presents itself chiefly in children, along with general tuberculosis.

12. Parasites.—In rare instances the echinococcus and the cysticercus cellulosæ are found in the heart.

13. Thrombosis.—The blood occasionally coagulates in some part of the vascular system during life, just as it does when drawn from the body by venesection. Such a coagulum, which is termed a *thrombus*, may take place in the arterial system, as in an aneurism, but more commonly it occurs in one of the cavities of the heart or in a vein. It may result from a retardation of the current of the blood, or may occur where the surface of the lining membrane with which it is in contact has become roughened, as in endocarditis. Cardiac thrombosis most commonly occurs in the right chambers of the heart, especially in the auricular appendix, near the apex of the ventricle, and

behind the carneæ columnæ. These coagula may either (1) be detached and block a branch of the pulmonary artery; (2) soften in the centre, forming a thick juice which resembles pus; (3) become organised and converted into masses of connective tissue; (4) be calcified by infiltration with lime salts.

14. Embolism.—In case a thrombus or a vegetation on one of the valves of the heart is detached, it is swept onwards by the force of the blood until it reaches a vessel through which it is unable to pass; it then becomes wedged in its new position and is termed an *embolus*. Of course, this is most liable to occur in that part of the vascular system which the thrombus has first to traverse after its detachment. Consequently, the vessels of the kidney, spleen and brain are most apt to be obstructed in diseases

Fig. 5.

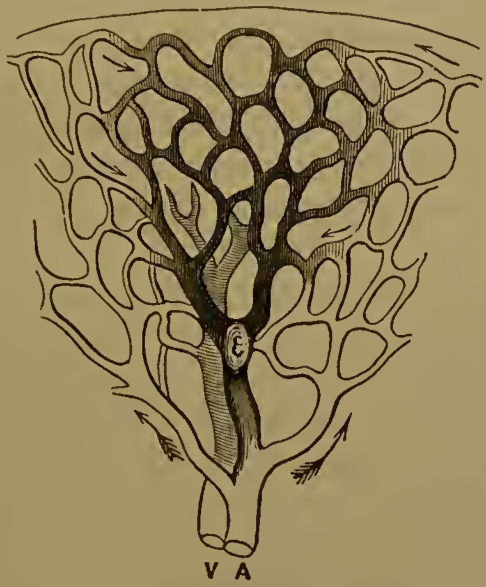


Diagram of an embolic hyperæmia (of the lung). A. Small artery occluded at E by an embolus. V. Vein, filled with a blood-clot arising from the stoppage to the circulation. The arrows show the collateral routes by which the congestion is produced.

(Rindfleisch.)

of the mitral and aortic valves; the pulmonary circulation when coagulation has taken place in the right side of the heart; the liver in affections of the organs whose blood is returned by the vena portæ.

The first result of an obstruction to the current of blood by an embolus is a loss of functional power in the parts thus deprived of their nutriment. Thus, paralysis takes place when a portion of the brain has in this way been suddenly rendered anæmic. If the circulation is restored by the blood finding its way through collateral branches no permanent injury is produced, but if such is not the case, the neighbouring vessels become congested and hæmorrhage usually occurs (see fig. 5). The structures permanently deprived of blood either soften or suppurate. The latter condition is most common in cases of ulcerative endocarditis and general pyæmia where the emboli contain micrococci.

15. CONGENITAL MALFORMATIONS OF THE HEART.

(1) *Defects of the Septum Ventriculorum* are usually associated with some abnormality of the great vessels. The anterior portion of the septum is often absent in cases of stenosis of the pulmonary artery, and the posterior portion in those where the aorta is contracted. The defect may be so great that there is virtually no septum existent, or only a minute aperture may be present.

(2) *Defects of the Septum Auriculorum* usually consist of patency of the foramen ovale. In some instances the hole is extremely small, and of little importance, but in others a large communication exists between the auricles and leads to serious consequences.

(3) *Stenosis of the Pulmonary Artery* is often associated with one of the before-mentioned lesions. It may be so complete that the orifice of the vessel is practically obliterated, and the lungs are supplied with blood from the aorta through a *patent ductus arteriosus*. When less severe the obstruction leads to hypertrophy and dilatation of the right ventricle.

(4) *Stenosis of the Aorta* is less common, and is almost always associated with some other congenital lesion.

(5) In addition to these several affections, *Transposition of the Aorta and Pulmonary Artery*, and *Malformations of the Valves* are occasionally encountered.

16. Make yourself acquainted with the size of the healthy heart, which you can ascertain by observing where the apex strikes the walls of the chest and by percussion. The impulse is usually in the fifth left costal interspace, about one inch and a half below, and three-quarters of an inch to the right of the nipple in the male, and at a corresponding distance from the edge of the sternum in the female, in whom the nipple is an uncertain guide. It is generally a little higher in children and lower in old people.

To estimate the size of the heart by percussion, you place the patient on his back, with the head slightly raised. Then tap lightly on the back of the forefinger of the left hand laid over the heart's region with the pulp of the forefinger of the right hand. If you percuss forcibly, you bring out dulness where the heart is covered by the lung. Commence where the sound is dullest, and gradually proceed outwards until the clear sound shows you that you have reached the edge of the lung. Mark the boundaries with a pencil or ink. You will find that the right boundary of the superficial dulness over a healthy heart is a vertical line along the left edge or the middle of the sternum extending downwards from the level of the fourth costal cartilage. The left boundary extends in a waving line from the sternum, opposite the fourth costal cartilage, to the apex of the heart. The inferior boundary is on a line extending from the lower edge of the sternum along the sixth costal cartilage to the place where the apex strikes the walls of the chest. (See fig. 6.)

17. Where the impulse of the heart cannot be felt, or is very feeble, you may have a difficulty in distinguishing the lower border from the liver dulness beneath it. Under such circumstances, you must employ auscultatory percus-

sion. Place the cup of the stethoscope over a part of the heart where the dulness on percussion is well marked, and tap with one finger until you reach the point at which the sound ceases to be conveyed to your ear. Mark this as the inferior boundary of the heart's region.

FIG. 6.

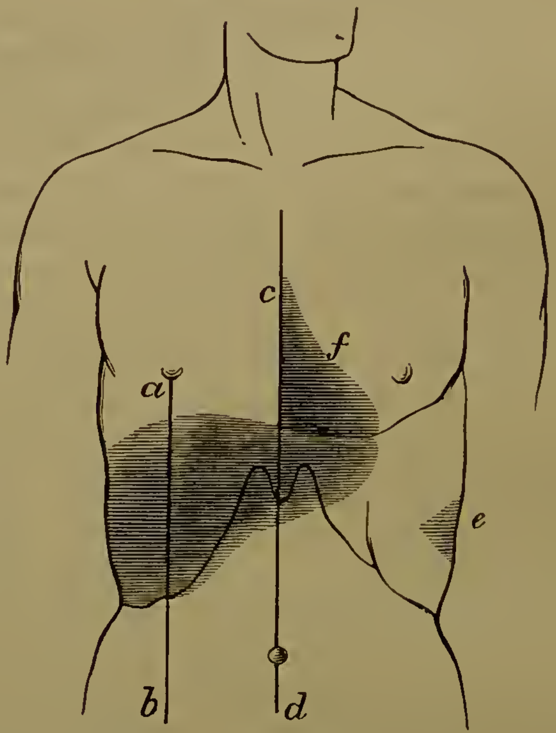


Figure showing the superficial dulness on percussion of the heart's region. *f.* Left boundary. *c.* Level of the fourth costal cartilage.

18. Under certain circumstances, the position of a healthy heart may become changed from alterations in the size or position of one of the neighbouring organs. Thus, it may be pushed upwards by distension of the stomach or intestines, by an accumulation of fluid in the peritoneal cavity, by an abdominal tumour, or an enlargement of the liver or spleen. It may be displaced to one side by a collection of air or fluid in the pleura (fig. 37), contraction of the lung (fig. 15), an intra-thoracic tumour, or an

abscess of the liver. It may be depressed by emphysema of the lungs (fig. 45). During your examination, you must be careful that the patient is lying quite straight, for the apex moves to the left if he is inclined to that side, whilst it may disappear or may beat to the right of its normal position when he is turned on the opposite side.

19. You must next accustom yourself to the normal sounds of the heart, and for this purpose a stethoscope is required. A word of advice may be useful as to the choice of a stethoscope. A wooden stethoscope may be employed for the examination of the heart. Before buying one, see that the ear-piece is sufficiently large and accurately fits your ear, and that the opposite end is of moderate size. The binaural stethoscope is, however, more useful, as it enables you to examine the patient with less fatigue. The double or differential stethoscope of Dr. Scott Alison is useful in many diseases of the lungs, and may be also employed with advantage in the diagnosis of valvular disease. If, for instance, you wish to ascertain whether a murmur originates in the mitral or the aortic valves, place one cup over the apex of the heart and the other on the sternum, just above the third costal cartilage. If the murmur originates in the mitral, the sound will be heard only, or most plainly, through the cup placed on the apex of the heart, but if it arises in the aortic valves it will be most plainly audible through the other tube.

20. There are two sounds of the heart. You hear the first most distinctly by placing your stethoscope over the apex; for the second, listen at the middle of the sternum, just above the third costal cartilage. The first sound is duller and longer than the second, coincides with the impulse of the heart, and is a little before the pulse at the wrist; the second coincides with the closure of the semilunar valves, and the flow of the blood from the auricles into the ventricles. Ordinarily, the sounds are best explored when the patient is erect, but in cases of disease you may require to examine him in different positions.

21. As the sounds of the heart are produced by the action of the valves, there are in reality four, and not two. Under certain conditions you hear both the sounds, of which the first or second sound is composed, and it is then said to be reduplicated. This is supposed to be the result of a want of synchronism in the action of the two sides of the heart. Reduplication of the second sound is frequently present in mitral stenosis, whilst the first sound is occasionally double in chronic kidney disease. It must be remembered, however, that either sound may be reduplicated, even when the heart is perfectly normal.

22. As the valves lie alongside, and behind, each other, and are partly covered by the lungs, we can best distinguish the sounds by listening at those parts of the chest to which they are most readily conducted by the currents of the blood. Thus, we hear the mitral sound best at the apex; that of the tricuspid at the right border of the sternum at the level of the fifth rib; that of the aortic valves on the right margin of the sternum, between the second and third ribs; whilst the sound of the pulmonary valves is most distinct in the second left intercostal space close to the sternum.

23. In case a valve acts imperfectly the normal sound is altered, and a *murmur* is produced. Murmurs are longer than the healthy sounds, and vary greatly in pitch; some being so faint that they are difficult to distinguish, whilst others are so loud and harsh they can be scarcely overlooked. You may, however, mistake a sound originating in the bronchial tubes or pleura for a murmur. In order to distinguish between them ask the patient to stop his breathing for a few seconds; if it be produced in the lungs, it will immediately cease along with the respiration, but will persist if connected with the action of the heart.

Some murmurs can be heard best in certain positions, so that you may have to examine the patient both when standing and when lying on his back; or it may be necessary to excite the action of the heart, by making him walk quickly or run, to enable you to detect some of the fainter sounds.

24. To ascertain which valve is affected, you must listen at the places at which the normal sound of each valve is

FIG. 7.

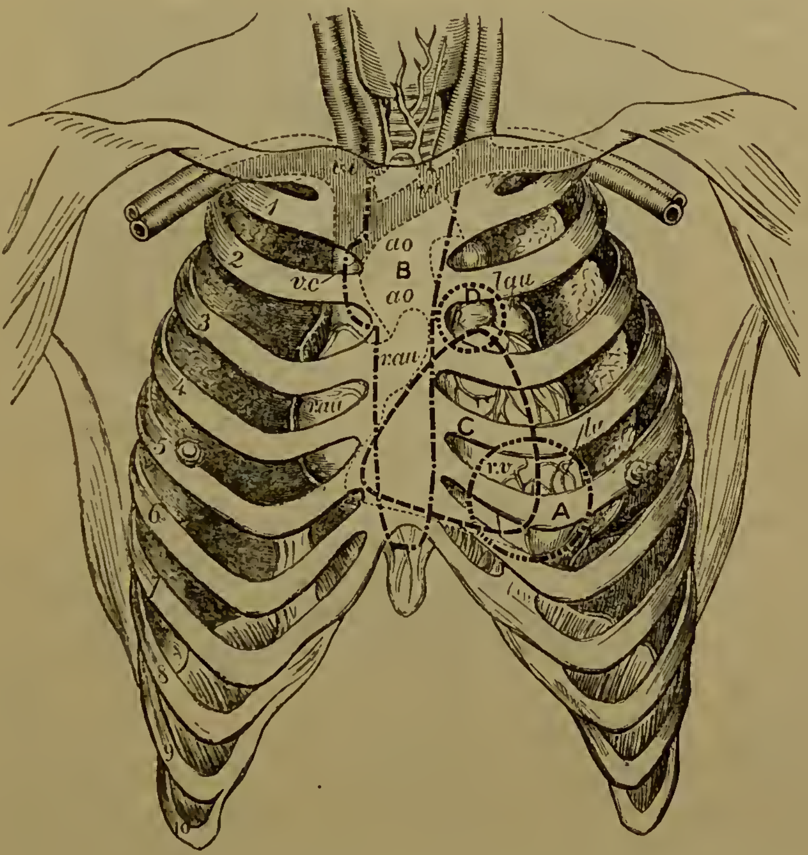


Diagram showing the areas over which the murmurs produced at the different valves of the heart are chiefly audible. A. The seat of the mitral murmur. C. The seat of tricuspid. B. Seat of the aortic. D. Seat of pulmonary murmur. *r. v.* Right ventricle. *l. v.* Left ventricle. *l. au.* Left auricle. *r. au.* Right auricle. *ao.* Aorta. *v. c.* Vena cava. (GAIRDNER.)

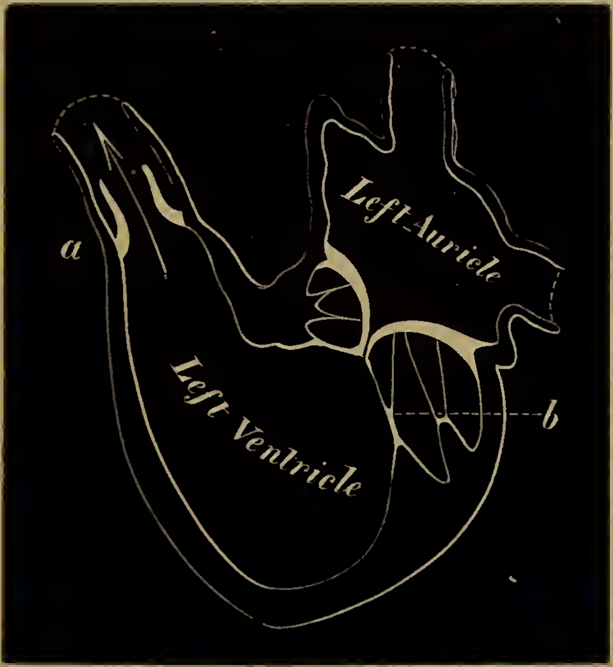
best heard, and find where the murmur is loudest. Place the stethoscope, for example, over the apex; if the murmur is loudest there (A, fig. 7), and inaudible, or only faintly audible, at the ensiform cartilage, and if it is conducted towards the axilla or can be heard at the inferior angle of the left scapula, you know that the *mitral valve* is diseased, or is incompetent to perform its functions. If its intensity is greatest over the lower part of the sternum (C, fig. 7), and it is only faintly heard or is inaudible at the apex, the *tricuspid valve* is the seat of the murmur. If it is loudest at the middle of the sternum, just above the third costal cartilage, it depends on an affection either of the aortic or pulmonary valves. If loudest above the second right costal cartilage, the *aorta or its valves*, if above the second left costal cartilage, the *pulmonary artery or its valves*, is the seat of the murmur.

25. Next, while listening through the stethoscope, place your finger on the carotid artery, and find whether the murmur corresponds with its pulsation (systolic), or whether it just precedes the impulse of the heart (presystolic), or occurs with, or directly after, the second sound (diastolic). The pulse at the wrist is not to be trusted, as it is rather later than the pulse in the carotid, while the interval between it and the heart's impulse is somewhat increased in some diseases of the valves.

26. Some students find a difficulty in understanding how the cardiac murmurs are produced, from not keeping clearly in their minds the actions of the heart that correspond to the two sounds. To assist you in this, the following diagrams are added. You will observe (fig. 8) that with the first sound the contraction of the ventricles takes place, the semilunar valves (*a*) are open, the blood is poured through them into the vessels, so that the pulse is produced in the arteries, and the auriculo-ventricular valves (*b*) are closed to prevent the blood being driven back into the auricles. As soon as the ventricles cease to contract (fig. 9) the semilunar valves (*a*) are closed to prevent the reflux of the blood from the aorta and pulmonary artery into the ventricles, whilst the auriculo-ventricular valves (*e*) are opened, so that the blood may flow from the auricles into the ventricles.

You will now understand that if a murmur accompanies or replaces the first sound, that is to say, occurs during the contraction of the ventricle, it must be produced either by the blood in its passage through the aortic or pulmonary valves (*a*, fig. 8) or by its being forced through a chink left by the imperfect closure of the auriculo-ventricular valves

FIG. 8.



Shows the ventricle in the act of contracting (first sound). Semilunar valves, *a*, open. Auriculo-ventricular valve, *b*, closed. Blood passing into arteries, *a*. Pulse at the wrist a little afterwards. Auricle refilling with blood. (DALTON.)

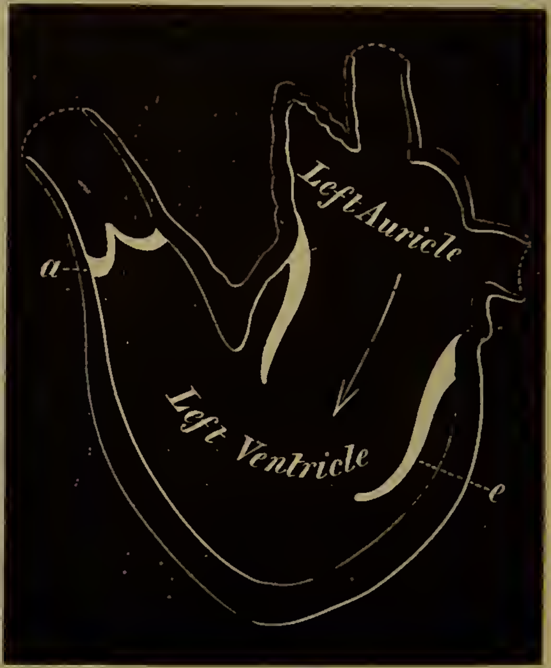
(*b*, fig. 8); or in other words, it is either *direct* (*b*, fig. 10) or *regurgitant* (*a*, fig. 10). If the murmur follows or replaces the second sound, it must arise either from the reflux of blood through a chink in the semilunar valves (*a*, fig. 9), or be produced by the blood flowing from the auricles through a constricted auriculo-ventricular valve (*e*, fig. 9); or, as seen in fig. 11, it must be regurgitant at the semilunar valves (*b*, fig. 11) or direct at the auriculo-ventricular valves (*a*, fig. 11).

27. *A mitral systolic murmur*, therefore, arises from the

blood being forced by the ventricle through a mitral valve incapable of perfect closure, into the auricle (regurgitant murmur), but sometimes it merely indicates a roughness, swelling, or deposit on the valve itself, without any imperfection in its function.

28. *A mitral presystolic murmur* is always the result of the blood passing through a constricted mitral valve from the auricle into the ventricle (direct murmur). This murmur is usually most intense at, or a little within, the point at which the apex beats; it is of a grating character, is ended suddenly by the first sound and impulse of the heart, and is generally attended by a thrill; it indicates constriction of the auriculo-ventricular opening, and consequently an obstruction to the entrance of the blood into the ventricle. In many of these cases a sharp first sound

FIG. 9.



Shows the ventricle after its contraction (after the second sound). Semilunar valves, *a*, closed. Auriculo-ventricular valve, *e*, open. Blood flowing from auricle into ventricle. (DALTON.)

FIG. 10.

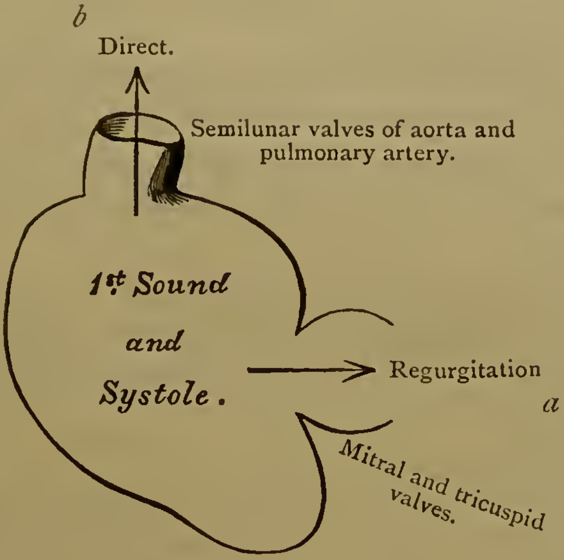
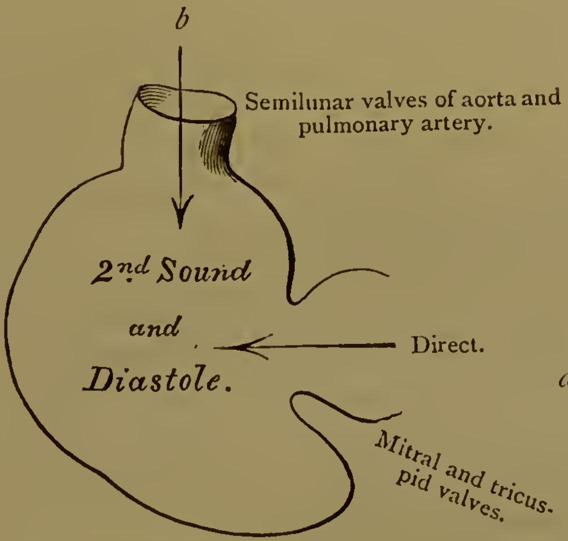

b
Direct.
Semilunar valves of aorta and pulmonary artery.
1st Sound and Systole.
Regurgitation
a
Mitral and tricuspid valves.

FIG. 11.


b
Semilunar valves of aorta and pulmonary artery.
2nd Sound and Diastole.
Direct.
a
Mitral and tricuspid valves.

Showing the murmurs that may arise in the systole and diastole of the heart. (After HOPE.) The arrows point the directions which are taken by the currents of blood; thus it is seen in fig. 10, that with the systole you may have a direct murmur in the aortic or pulmonary artery, *b*, or a regurgitant murmur at the mitral or tricuspid valves, *a*; whilst, as in fig. 11, these may be observed to be reversed in the diastole of the heart.

can be heard over the sternum, unattended by a murmur, and this seems to arise from the closure of the tricuspid valve being heard alone.

29. *A tricuspid systolic murmur* arises from regurgitation of the blood from the right ventricle into the right auricle (regurgitant murmur). It is much more rare than the mitral murmur, and is scarcely audible above the third rib (see c, fig. 7).

30. *A tricuspid presystolic murmur* is exceedingly rare and indicates narrowing of the tricuspid valve. It is best heard at the left border of the sternum near the fourth costal cartilage. It is rarely heard, excepting in young persons, and chiefly in females.

31. *An aortic systolic murmur* is produced by the blood passing along the aorta or its valves (direct murmur); it is almost inaudible at the apex, but is conducted upwards to the inner end of the right clavicle, and can be generally heard in the carotid arteries.

32. *An aortic diastolic murmur* arises from reflux of the blood from the aorta into the ventricle (regurgitant murmur). It is heard loudly down the sternum, is usually audible at the apex, and fills up the interval of silence that, in the normal condition, exists between the second and the first sounds of the heart (see *b*, fig. 11).

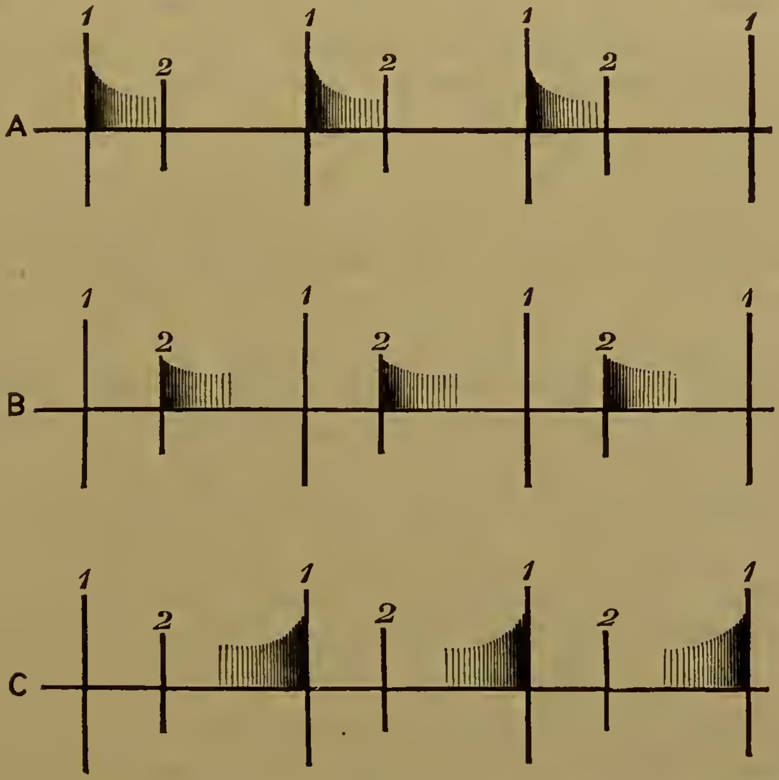
33. *A pulmonic systolic sound* from the blood passing into the pulmonary artery (direct murmur); (see *b*, fig. 10).

34. *A pulmonic diastolic murmur* (from the blood escaping through the pulmonary valves into the right ventricle) is very rare, but when present it is heard at the junction of the third left costal cartilage with the sternum and extends downwards along the sternum.

35. There is often much difficulty experienced, at first, in distinguishing between the mitral presystolic and the mitral systolic murmur, and between the mitral presystolic and the aortic diastolic. Keep your finger on the carotid artery whilst you are listening to the heart, and carefully watch what relation the murmur bears to the pulse, or in

other words to the first sound of the heart. In the accompanying diagram (fig. 12), copied from Dr. Gairdner, you will observe that at A a systolic murmur *directly* follows the first sound, and (as shown by the diminished depth of the shading) gradually lessens in intensity until it ceases just before the second sound. At B, the diastolic murmur *directly* follows the second sound, and dies away before the next systole of the heart. At C, on the contrary, the presystolic murmur begins after the second sound, and increases in intensity until it is suddenly arrested by the contraction of the ventricle. In addition to this the mitral presystolic murmur is of a grating

FIG. 12.



A. Shows the relation of the systolic murmur to the sounds of the heart. B. Shows the relation of the diastolic murmur. C. Shows the relation of the presystolic murmur. (GAIRDNER.)

character, is usually attended by a "thrill" perceptible to the hand, and is confined to a limited space about and within the apex. The systolic murmur is soft, seldom attended by a thrill, is conducted towards the axilla, and may be generally heard at the angle of the left scapula. When a systolic and a presystolic mitral murmur co-exist, listen for the former towards the axilla, for the latter at, or to the right of, the apex. The diastolic aortic is usually soft, is heard loudly at the sternum opposite the fourth left costal cartilage, is attended with a jerking pulse, and usually the second sound is inaudible at the root of the neck.

36. The state of the pulse affords the best indication of the manner in which the heart is performing its office. Never feel the pulse when you begin to speak to the patient, but wait until he has overcome any nervousness your visit may have excited. The application of a single finger to the artery is sufficient to enable you to count the rapidity of the pulse, but it is better to apply two or three fingers when you wish to estimate its other conditions.

37. In feeling the pulse you must take notice of its *frequency*, *regularity*, *fulness*, *strength of pulsation*, and its *resistance to pressure*. It is most frequent in infancy (110–120 in the minute), in children of three years of age it ranges from 90 to 95, and in adults is usually about 72. It is generally very slow in compression of the brain; quick in fevers, in inflammation, and where there is great debility. The pulse is said to intermit when a beat ceases to be felt every few pulsations. It is irregular when the beats occur at irregular intervals. The strength and fulness of the pulse are of great importance, as they indicate the force with which the circulation is being carried on. It is strong in young persons and in hypertrophy of the heart, feeble in dilatation of that organ and in those weakened by disease. The compressibility of the pulse must always be considered. If the pulse ceases to be felt on a slight pressure of the finger, you may be sure that the circulation is in a feeble

state. In old persons you may mistake a feeble pulse for a strong one, from the coats of the artery being thickened. To ascertain if this is the case, compress the vessel and then move your finger along it, when you will readily detect any hardness of the coats that may be present.

38. The condition of the pulse is best shown by the sphygmograph, and as this instrument is occasionally of use in the diagnosis of diseases of the heart and the larger arteries, you should practise yourself in its employment. The instrument consists of a flexible steel spring, having at its end a small plate of ivory for the purpose of resting on the radial or other artery. The movement communicated to the spring by the pulse is transmitted to a light lever which registers the motions of the artery upon a piece of paper or smoked glass, travelling at a uniform rate by means of clockwork.

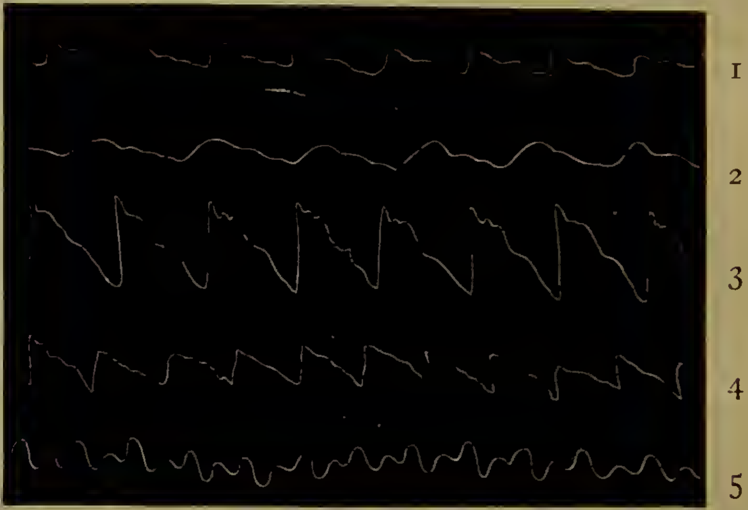
39. In fig. 13, No. 1, you see a tracing of the normal pulse, and you will remark that there is a succession of curves, each one of which presents an ascending line, a summit, and a descending line. As the ascending line is produced by the left ventricle throwing its contents into the arteries, it is evident that the more quickly the heart overcomes the forces opposed to it—viz., the elasticity of the vessels and the tension of their contents—the more vertical will be that line. Thus, in No. 3, the line is vertical; the case was one of aortic regurgitation, and the heart was able to throw its blood rapidly into the vessels partially emptied by the escape of their contents into the ventricle: but it is oblique in No. 2, where an obstruction at the entrance of the aorta caused a difficulty in the distension of the arteries. At No. 4 a tracing is given of the irregularity of the pulse caused by disease of the mitral valve.

In the normal pulse the line of descent is more oblique than that of the ascent, because the tension of the arteries gradually subsides in proportion as the elasticity of the aorta enables it to empty itself through the capillary system.

In aortic regurgitation (3, fig. 13) the fall is sudden; in cases where the arteries are thickened it is usually very oblique.

In certain cases strongly marked undulations occur in the line of descent (dicrotism). The best marked examples are to be found in typhus (5, fig. 13). In aneurism of the descending thoracic aorta the dicrotism is often much increased in both pulses, particularly in the right.

FIG. 13.



Sphygmographic tracings in different diseases.
(SANDERSON and FOSTER.)

40. You may suspect disease of the heart if the patient complains of pain in the left side, if there is palpitation, blueness of the lips and face, difficulty of breathing, cough, expectoration, dropsy of the limbs, or if he has an irregular or intermitting pulse. Ascertain if the symptoms of the disease have commenced suddenly (acute disease), and, if so, begin at (41); but if gradually (chronic disease), pass on to (58).

SECTION I

Acute Diseases of the Heart

41. The acute diseases include pericarditis (first and second stage), endocarditis, and nervous palpitation. It will simplify your diagnosis to begin with percussion, for if the cardiac dulness is much enlarged you have to deal with pericarditis accompanied by effusion; if not, any of the others may be present.

42. *a.* You find the dulness over the heart's space increased and of a pyramidal shape, the apex being above; the heart's sounds, especially the first, are diminished, the impulse lessened or imperceptible. The apex often beats above and to the left of its normal position (see fig. 14).

The disease is *pericarditis with effusion of fluid.*

In this stage there is rarely much pain or tenderness, but short hacking cough, difficulty of breathing and anxiety are usually complained of. The pulse is rapid, sometimes irregular, and the patient lies on his back, and is unwilling to change his position. The sounds are diminished on account of their being transmitted through fluid: the apex is sometimes raised by the pressure of the fluid. There may be bulging of the cardiac region in young persons. The upper border of the dulness reaches, when the effusion is moderate, to the second or third costal cartilage, but, when more extensive, the whole sternum may be dull on percussion. There is often dulness on percussion and tubular breathing at the angle of the left scapula, from the pressure exerted by the distended pericardium upon the lung. The extension of the dulness to the left beyond where the apex beats is one of the most certain indications. The line of dulness varies with the position of the patient, and the area is wider when he lies down than when he sits upright. You should mark out with a pencil the area of dulness, and daily observe its increase or diminution.

43. Myocarditis not infrequently accompanies inflammation of the pericardium or endocardium, but it also occurs in pyæmia, diphtheria and other infectious fevers. It is characterised by a rapid and feeble action of the heart, small, quick and irregular pulse, great dyspnœa and faintness. Death may occur very suddenly. Its presence may be suspected if these symptoms are present in a case of pericarditis in which the evidence of a large amount of exudation is absent.

44. There is no alteration in the physical signs when blood or pus is present in the pericardium instead of the ordinary exudation. In *very rare cases*, gas is present in the pericardium and the sound on percussion is then tympanitic, and the heart's sounds may have a metallic character.

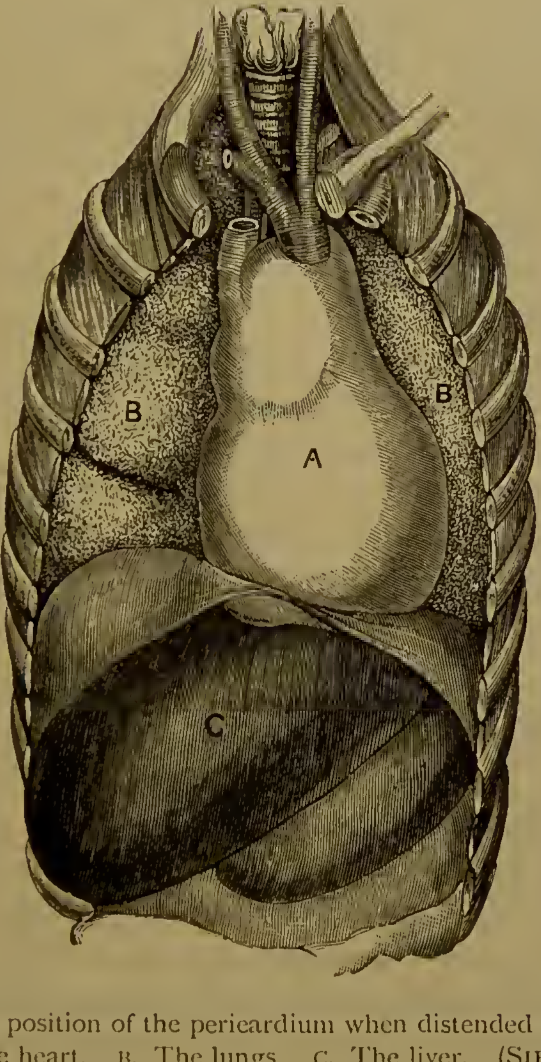
45. You are most likely to mistake hydropericardium for pericarditis with effusion. Pericarditis is usually attended in the early stage with fever, pain, tenderness on pressure, and a friction sound, none of which are present in hydropericardium. Pericarditis is almost always the result of acute rheumatism, kidney disease, pyæmia, or scarlatina, but dropsy of the pericardium seldom occurs except as an accompaniment of general dropsy. An increased area of dulness in the heart's region may arise from pleurisy, but there is then also dulness behind and at the side of the left chest, attended with absence or diminution of the vocal fremitus, and of the sounds of respiration.

46. *b.* The dulness over the heart's space is not much, if at all, increased in extent, the sounds are normal, but are obscured by a double, superficial, creaking sound, usually heard earliest at the base of the heart; the impulse of the heart is usually increased.

The disease is *pericarditis with exudation of lymph.*

Pericarditis in its early stage is sometimes attended with pain over the heart, increased by pressure, movement or deep inspiration. In some cases there are pain and tenderness on pressure in the epigastrium. Remember, however, that the disease may be present without pain or any other symptom pointing to the heart, and that the patient may

FIG. 14.



Increased dulness on percussion of pyramidal shape.

Impulse lessened.

Sounds feeble, especially the first.

In most cases a friction sound can be heard, at the upper part.

Shows the position of the pericardium when distended with fluid.
A. The heart. B. The lungs. C. The liver. (SIBSON.)

suffer only from delirium, or be affected with severe and persistent vomiting. Therefore frequently examine the heart in all cases of rheumatic fever, kidney disease and chorea, or whenever a patient is affected with constant hiccough or vomiting.

47. The creaking or rubbing sound is produced by the surfaces of the pericardium roughened with lymph rubbing against each other. You may mistake this sound for a murmur arising from endocarditis. You must therefore note that in pericarditis the sound is usually audible during the whole period of the heart's action, that it is superficial, is apt to vary in its character, and is confined to the region of the heart; that by pressure with the hand or stethoscope you may often alter the character of the sound, or make it louder, and that pericarditis is generally attended with pain and tenderness. Pericarditis and endocarditis, however, frequently occur together.

48. A friction sound in the heart's region often arises from pleurisy. When you suspect this to be the case, make the patient stop his breathing, and the creaking will cease if it arises from inflammation of the pleura only. A friction sound is, however, occasionally produced by the motions of the heart on a portion of lung covered with lymph. In such cases the sound extends beyond the heart's region, is not heard loudest at the base, and is usually soon followed by the signs of effusion into the pleura.

49. There are no signs which certainly indicate the existence of pericardial adhesions. The most important are, that the area of the heart's dulness does not alter, either with a change in the patient's position or on deep inspiration; that the point at which the apex strikes the chest is unaffected by change of position or full inspiration; and that one or more intercostal spaces, or the epigastrium, seems drawn in along with each pulsation of the heart. All of these signs are, however, of doubtful value.

50. *c.* One of the heart's sounds, or both, is accompanied or replaced by a lengthened blowing sound (a murmur).

The disease is *endocarditis.*

The murmur is the result of thickening, roughening, or imperfection of one of the valves. Endocarditis almost always affects either the mitral or aortic valves, and when, as occasionally happens, the tricuspid valve is implicated, the mitral will be also found to be diseased.

Endocarditis may be accompanied by anxiety, hurried breathing, increased impulse of the heart, rapid and often irregular pulse, cough, and fever. Like pericarditis, it generally develops during the course of rheumatic fever, scarlatina, chorea, or diseased kidneys. It is often present without any symptoms likely to direct attention to the heart, so that you have to trust to physical signs alone.

51. You should bear in mind that persons suffering from endocarditis are liable to embolism (14), the symptoms of which vary according to the organ affected. Thus, when a vessel in the brain has become suddenly plugged there may be hemiplegia, or, in rare cases, only delirium and high fever, unaccompanied by paralysis. When the kidney is involved, the urine is bloody or albuminous; in the case of emboli of the spleen, the organ usually enlarges, and rigors and elevations of temperature closely simulating attacks of ague may present themselves. If the main artery of a limb is obstructed, there are usually pain and tenderness over the vessel, and its branches cannot be felt to pulsate below the plug, whilst the limb becomes pale, cold, and numb. In some cases the circulation of the limb is gradually restored, in others gangrene is the consequence.

52. The chief difficulty is to ascertain whether a murmur arises from *recent* endocarditis, or is due to old valvular disease. The diagnosis is determined by the presence of fever in acute endocarditis, and by the absence of the enlargement of the heart that always follows long-standing disease of the valves. The murmur is usually loudest at the apex, because the mitral is most frequently attacked. In both endocarditis and pericarditis, increased action of the heart often precedes the development of the stethoscopic signs.

53. *Ulcerative* or *septic endocarditis* is a rare, but very dangerous, form of the disease, and seems to arise from

the presence of micro-organisms in the blood. It mostly presents itself in old cases of valvular disease, but it may follow acute pneumonia, scarlatina, diphtheria, puerperal or other infectious fevers.

It comes on suddenly with chills or rigors, followed by a rapid rise of temperature, which often attains 104° or 105°, falling again to or a little above the normal point. From the sudden elevations and rapid falls of the temperature, which are often accompanied by profuse perspirations, the disease may closely simulate attacks of ague. The pulse is rapid, but varies with the temperature. Not infrequently there is a petechial rash upon the skin and the urine is often albuminous. In many cases delirium is a prominent symptom.

Usually a systolic murmur can be heard either at the apex or at the base of the heart, but this may be absent if the ulceration does not affect one of the valves. In some cases optic neuritis or retinal hæmorrhage can be seen with the ophthalmoscope. Emboli are often present in some of the organs, and especially in the spleen, so that it becomes enlarged and projects below the ribs.

54. Ulcerative endocarditis may closely simulate typhoid fever or pyæmia. It may be distinguished from typhoid by its usually occurring in old cases of valvular disease, by the sudden onset of the symptoms, the great variations of temperature, and by diarrhœa being a less prominent symptom. The development of a murmur in the heart's region, or a marked alteration in the character of one that may have been previously present, will further enable the student to distinguish between these diseases. It can only be diagnosed with certainty from pyæmia when a murmur can be discovered over one of the cardiac valves.

A number of organisms have been obtained by cultivations made from the vegetations present on the valves, and it is probable that the disease is the result of the action of one of these on the blood.

55. *d.* The heart's sounds are abnormally loud and clear;

the impulse increased, but abrupt, quick, and brief, the apex beats in its natural place, and the pulse is not permanently irregular.

The disease is *palpitation.*

Attacks of palpitation may take place in cases of cardiac disease, or in persons in whom the heart is perfectly healthy. In the latter it often occurs in paroxysms, and is attended with feelings of distress in the heart's region, dyspnœa, panting respiration, and a sensation of faintness. There is rarely much pain, but in young females it may be accompanied by pain referred to the left side immediately below the nipple, or to the left hypochondrium. There is often great anxiety and an apprehension of impending death. The attacks are apt to take place during the night, and are then very alarming to the patient. In cases of anæmia there is generally a systolic murmur to be heard at the base of the heart or the left side of the sternum.

The most common causes are flatulence arising from indigestion, anæmia, gout, rheumatism or disordered menstruation. In some cases the attacks arise from mental anxiety, overstudy, or the excessive use of coffee, tea or tobacco.

56. *Intermittent action of the heart* is habitual to some persons and may continue for many years without affecting the general health. When it occurs in the course of acute diseases it indicates a feeble condition of the organ, and therefore requires attention. A sensation as if the heart suddenly tumbled over is often complained of by persons suffering from indigestion, and arises from an occasional intermission in the pulsations of the heart.

57. *Irregularity of the heart* points to feebleness in its action. It is common in various organic diseases, but may be also present when the organ is in a healthy condition as regards its structure.

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF ACUTE DISEASES OF THE HEART.

	Pericarditis with Liquid Effusion.	Pericarditis with Lymph.	Endocarditis.	Ulcerative Endocarditis.	Nervous Palpitation.
Etiology	Acute rheumatism. Kidney disease. Pyæmia. Chorea	Acute rheumatism. Kidney disease. Pyæmia. Chorea	Acute rheumatism. Scarlatina, &c. Kidney disease. Pyæmia. Chorea	Acute rheumatism. Old valvular disease. Acute pneumonia. Pyæmia. Scarlatina, &c.	Anæmia. Dyspepsia. Hysteria
Pain over heart	Rarely severe	Rarely severe	None	None	Pain of left side common
Tenderness on pressure	Usually present	Usually present	None	None	None
Dyspnœa	Usually present; may be severe	Respiration quickened	Rare	Respiration quickened	Often rapid breathing
Pulse	Rapid. May be feeble and irregular	Quick and small	Quickened	Much quickened	Quick, often irregular or intermittent
Temperature	Temperature moderately raised	Temperature moderately raised	Raised moderately	High, remittent, often rigors	Not elevated
Dulness on percussion	Extensive and pear-shaped	Not increased	Not increased	Not increased	Not increased
Impulse of heart	Diminished or imperceptible	Increased	Usually increased	Usually increased	Much increased
Sounds of heart	May be inaudible or feeble	Double, superficial friction sound	One or more murmurs	Usually a murmur	May be a hæmic murmur
Emboli in various organs	None	None	Occasionally	Commonly present	None

SECTION II

Chronic Diseases of the Heart

58. The chronic diseases of the heart are hypertrophy, dilatation, chronic pericarditis, hydropericardium, diseases of the valves, and fatty heart. Observe where the apex strikes the chest, and mark out by percussion the size of the organ; the first four diseases are always attended by an enlarged area of dulness; disease of the valves and fatty degeneration are not necessarily attended with increased dulness, although this is usually the case, as they are often associated with one of the former conditions.

A. You find the area of dulness increased.

59. *a.* The first sound of the heart is dull, muffled, and prolonged; the second rather lower pitched than normal, the impulse forcible, slow and heaving, the apex beats at a lower point than in the normal condition.

The disease is *hypertrophy of the heart.*

The most common cause of hypertrophy is some obstruction to the circulation of the blood that requires an increased effort of the cardiac muscle to overcome it, such as disease of the aortic or semilunar valves in the case of the left, or mitral affection in that of the right, ventricle. The increased tension of the vascular system present in chronic disease of the kidneys, over-action of the heart, as in "Graves' disease," laborious occupations, or an adherent pericardium, likewise tend to produce it. Dilatation of the heart also gives rise to it by the increased amount of blood contained in its cavities. Some believe that a certain amount of hypertrophy is generally present in pregnancy. In all cases, therefore, you must search for the cause that has given rise to the hypertrophy.

The pulse is generally firm and strong. The increased impulse arises from the greater strength of the organ. The sounds are deadened because transmitted through so large a mass of muscle. Hypertrophy of the heart is generally accompanied by cough, expectoration, and dyspnœa; but as it seldom exists alone, but is usually the result of some disease of the valves, lungs, or kidneys, the physical signs and the symptoms vary according to the existing complications. Thus, we usually find murmurs from valvular affections, or the symptoms of kidney disease present themselves. When the left ventricle is chiefly affected, the apex beats below its normal position, and the carotids pulsate violently; when the right ventricle is mainly enlarged, the pulsation of the apex is diffused and ill-defined, the impulse is forcible at the lower end of the sternum, the second sound is louder over the pulmonary than over the aortic valves, and there are often swelling and pulsation of the jugular veins, which are most plainly seen when the vein is compressed in the middle of the neck. In hypertrophy of the left auricle there is well-marked pulsation to the left of the sternum above the fourth costal cartilage.

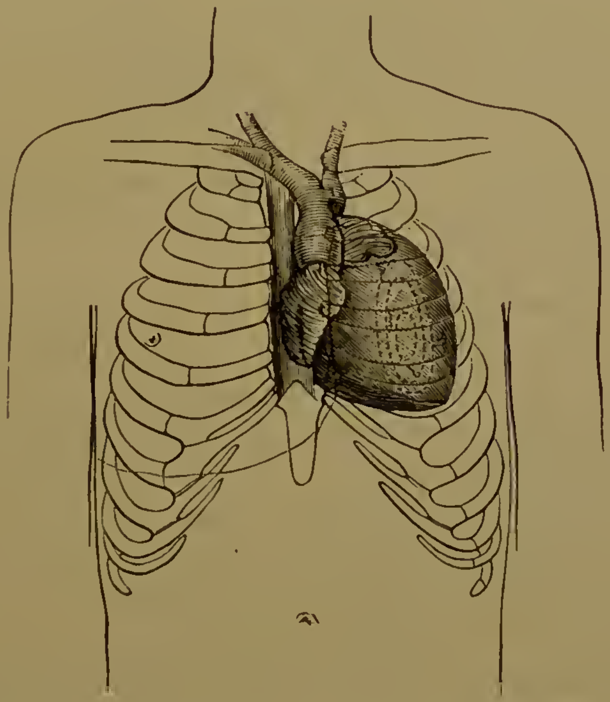
60. In cases of contraction of the left lung produced by an old cavity or a former pleurisy an increased space of the heart may be left uncovered by the lung, so that you will meet with an unusual amount of dulness on percussion and an increased area of pulsation (see fig. 15). You can distinguish such cases from hypertrophy, by noticing that the apex does not beat at a lower point than it normally does, that the impulse is not of the heaving character of hypertrophy, and by a history of the symptoms of phthisis or pleurisy with effusion.

61. *b.* The first sound of the heart is clear, short, and sharp, resembling the normal second sound, the heart's action is irregular, the impulse feeble and more extensive than usual, sometimes slightly undulatory; the apex beats at a lower point and more to the left than natural.

The disease is *dilatation of the heart.*

The most common causes of dilated heart are disease of the valves and emphysema of the lungs. Emphysema masks the enlargement, by causing the heart's region to be abnormally clear on percussion; it also pushes the heart, even when healthy, downwards towards the epigastrium. It is in some cases impossible to detect the apex of the heart by palpation, even when the impulse is visible. The first sound in extreme cases may be almost inaudible. The liver is almost always enlarged, and slight jaundice is not unusual. The pulse is feeble, irregular or intermitting. The most prominent symptoms are distressing palpitation, dyspnœa, cough, expectoration, blueness of the face and lips, dropsy, disordered digestion, and scanty, often albuminous, urine. All these symptoms result from the enfeebled action of the heart. The feeble impulse and clear

FIG. 15.



Position of the heart and great vessels in a case of contraction of the left lung. (After SIBSON.)

sounds arise from the opposite causes to those of hypertrophy. Murmurs are often present from co-existing affections of the valves.

Hypertrophy and dilatation generally co-exist; when the hypertrophy is greater than the dilatation, the dulness of the heart's space is chiefly increased from above downwards, but when dilatation is in excess, the dulness is greater transversely.

62. *c*. The heart's sounds are feeble and distant; the impulse lessened; the shape of the dulness on percussion is pyramidal, with the apex of the pyramid above.

The disease is *either hydropericardium or chronic pericarditis.*

Hydropericardium seldom occurs except as an accompaniment of general dropsy. For its diagnosis from pericarditis with effusion, see (45).

63. It is sometimes difficult to distinguish between a greatly dilated heart and extreme effusion into the pericardium. In pericardial effusion the area of dulness is pear-shaped, the apex is usually elevated, the heart's sounds below are muffled or distant, but may be clear above, and a friction sound can be usually detected at the base. In dilatation the dulness is of a more square shape, the apex is shifted to the left or beats in the epigastrium; both sounds can be heard over the whole of the heart's region, and the area of the impulse is more extensive than in pericardial effusion.

B. The area of dulness is not necessarily increased.

64. *a*. One of the sounds of the heart, or both, is replaced, or accompanied by a blowing sound (a "murmur").

There is disease of *one of the valves of the heart.*

As a general rule all presystolic and diastolic murmurs indicate an organic change in the valves in which they are produced, but systolic murmurs may arise from functional causes as well as from structural disease. Thus, a systolic murmur audible above the third left costal cartilage is very frequently produced by anæmia. If the patient is young, if the lips and conjunctivæ are pale, if he has no general symptoms of heart disease, the murmur probably arises from a deficiency in the quantity of the blood, or an alteration in its quality; but if the heart is enlarged or other valves are diseased, if the patient has suffered from acute rheumatism, or is at or past middle life, the sound probably arises from disease of the vessel or its valves.

65. A systolic mitral murmur usually indicates regurgitation into the left auricle, but this is not always the case. As, however, a valve seldom remains long imperfect without giving rise to hypertrophy and dilatation, your diagnosis must be determined by the presence or absence of these conditions. If, for instance, you should find, along with a mitral systolic murmur, increased impulse of the heart and accentuation of the second sound to the left of the sternum in a person suffering from cough, expectoration, difficulty of breathing, or general dropsy, you would conclude that there was regurgitation; whilst if the murmur had existed for some length of time without changes being produced in the chambers of the heart, you would suppose the valve was still capable of performing its functions.

66. Valvular disease of the heart is usually the result of acute endocarditis in early life, but in persons of middle or advanced age they are often caused by chronic rheumatism, gout, or syphilis. In rare instances they are produced by severe strains or over-exertion.

In the case of the mitral and tricuspid valves the symptoms are very similar, whether their function is impaired by constriction, or by changes that give rise to regurgitation. Great narrowing of the aortic valves, however, produces alterations in the circulation that differ from those attending regurgitation.

67. In most cases when the disease of a valve occurs in a person otherwise healthy, hypertrophy of the chamber in

which the valve is situated takes place, and the increased force with which the blood is propelled compensates for the obstruction to the current produced by the valvular imperfection. You will, therefore, occasionally find that, although the stethoscope proves that there is a serious defect in one of the valves, the patient is free from any symptoms of heart disease. But if from general debility, fever, or any other cause, he becomes enfeebled, the power of the muscular wall of the heart is diminished, the compensation is lost, and the symptoms of obstruction to the circulation are quickly manifested. Emboli are apt to be formed in the heart in chronic valvular disorders, as in acute endocarditis, and, if swept into the general circulation, they obstruct the vessels and impair the functions of the organ in which they become arrested.

68. In *chronic mitral disease*, so long as the right side of the heart is not dilated, the chief complaints are of a sense of distress, sometimes of acute pain in the region of the heart, difficulty of breathing on exertion, often of cough and expectoration. The pulse is at first full and regular, but as time goes on and the compensation fails, it becomes small, weak, irregular and intermitting.

69. Whenever *dilatation of the right ventricle* takes place, whether from mitral disease, emphysema of the lungs, or any other cause, regurgitation is apt to occur through the tricuspid valve, although the structure of the valve may remain perfect. The skin of the face is then congested, the lips are of a bluish tint, the jugulars large and pulsating. The liver is found to be enlarged, sometimes pulsating, and the patient complains of vomiting, flatulence, pain after food, and other symptoms of imperfect digestion. The urine is scanty, high-coloured and albuminous, and dropsy of the limbs, and sometimes of the abdomen, takes place.

70. In *regurgitation through the aortic valves* hypertrophy of the left ventricle is the result, and often so completely compensates for the imperfect action of the valves, that no symptoms may be complained of for a considerable time.

Afterwards, the effects of the badly filled vessels are apparent, the patient becomes pale and feeble, and attacks of angina, often of great severity, present themselves. From the force with which the blood is thrown into the imperfectly filled arteries and from the sudden fall in pressure in them caused by the escape of part of their contents through the valves, the pulse affords a characteristic sensation to the finger (" waterhammer pulse.") Again, if you feel the radial artery as the arm lies horizontally and then raise it upwards, you will remark that even this slight change in position has sufficed to lessen the strength and volume of the pulse. In well-marked cases the ophthalmoscope may enable you to detect pulsation in the arteries of the retina, and if the nail is drawn across the skin of the forehead, it leaves a red line, the colour of which becomes deeper at each impulse, and paler at each diastole of the heart.

71. You must bear in mind that more than one valve may be affected, so that different murmurs may be met with in the same patient. Thus, disease of the mitral and the aortic valves may be present at the same time, or mitral stenosis and regurgitation through the tricuspid valve may be found together.

72. You will occasionally meet with cardiac murmurs arising from congenital malformations of the heart. They vary in situation according to the nature of the abnormal condition, but are most commonly heard over the sternum or at the orifice of the pulmonary artery. Hypertrophy and dilatation of the heart are also usually present. In the slighter cases there is a history of shortness of breath and of cyanosis after moderate exertion from an early period of life. In the more marked instances of malformation, the cheeks, lips, ears, hands and feet are of a blue colour, the extremities are cold, the patient feeble and ill-developed, the ends of the fingers clubbed and the nails curved.

The history of cyanosis from an early period of life, and an absence of a history of rheumatism, will prevent your confounding such cases with ordinary valvular disease.

73. *b.* The sounds of the heart are feeble, impulse very weak. When, along with these physical signs, and without other apparent cause, the patient is exceedingly feeble, subject to palpitation, severe attacks of dyspnœa, *faintings*, and has either a very feeble and quick, or a very slow or irregular pulse, you may suspect *Fatty Degeneration of the Heart.*

I have put *suspect:* for the positive detection of fatty heart is very difficult, and in many cases, with our present means of diagnosis, impossible. It is stated by some authors that a white ring round the cornea (arcus senilis), when it is accompanied by other signs, renders the existence of fatty degeneration of the heart probable. Rupture of a fatty heart sometimes occurs, generally of the left ventricle. Death usually takes place instantaneously from hæmorrhage into the pericardium. In rare cases severe pain is suddenly experienced in the region of the heart, and the patient suffers from intense dyspnœa until his death.

74. *Fibroid degeneration of the heart* chiefly occurs in males of middle age. It presents symptoms very similar to those of fatty degeneration. The pulse may be very slow or small, rapid and irregular, and there may be the same tendency to attacks of faintness and syncope. As a rule, the attacks of angina are more frequent and severe. Some affected with this disorder appear to have enjoyed good health. Death often takes place suddenly. The diagnosis will be assisted if you can find that the patient has suffered severely from syphilis.

75. *Aneurism of the heart* is generally accompanied by the symptoms of hypertrophy with dilatation, unaccompanied by any murmur. In some instances a loud murmur has been present.

76. *Angina pectoris* is a neuralgic affection of the heart. It is accompanied by agonising pain in the chest and arms, coming on suddenly; the pulse is small and rapid,

the breathing hurried and laboured, the face pale, often covered with cold perspiration; the patient maintains the sitting posture and is unwilling to make the slightest exertion.

Angina pectoris is commonly met with in males of middle or advanced age. The attacks are most liable to occur after exertion, such as walking up a hill, exposure to a cold wind, or after mental excitement. They are especially apt to take place when exertion has been undertaken shortly after a meal, but they may come on during the night, when the patient has been at rest for some time. An attack may last only for a few minutes or it may continue for hours. The seizures are liable to recur, are very dangerous, and chiefly affect those who are suffering from diseases of the valves, fatty degeneration of the heart, or atheroma of the coronary arteries, but they may also occur in persons who are free from cardiac disease.

77. Angina pectoris may be confounded with spasm of the stomach or the passage of a gall-stone. Gastric spasm usually occurs in young females, angina pectoris in males of middle or advanced age; in the former the suffering is less severe and more confined to the chest or epigastrium, the heart's action is less depressed, and there is not the same disinclination to movement as in the latter; there is also usually a history of dyspepsia, palpitation, or of hysterical symptoms, while the physical signs of heart disease are absent. In biliary colic the pain is usually situated in the epigastrium or near the navel, and when it affects the chest it seldom extends to the arms; vomiting is apt to occur, the pulse is less feeble, there is less disinclination to movement than in angina pectoris, and there is often a history of previous attacks followed by jaundice, or by the passage of a biliary calculus.

TABLE OF THE SYMPTOMS AND PHYSICAL SIGNS OF CHRONIC DISEASES OF THE HEART.

	HYPERTROPHY.	DILATATION.	VALVULAR DISEASE.	FATTY HEART.	ANGINA PECTORIS.
Etiology	Valvular disease. Contracted kidney. Over exertion	Emphysema of lung. Valvular disease. Adherent pericardium	Endocarditis. Chorea. Gout. Rheumatism. Syphilis	Old age. Wasting diseases. Disease of coronary arteries	Valvular disease. Aortic aneurysm. Disease of coronary arteries
Pain over heart	Fulness and discomfort	No severe pain	Common in mitral and aortic disease	None	Attacks of severe spasmodic pain
Dyspnœa	Not severe	Often severe and continuous	Especially severe in mitral and tricuspid diseases	Attacks of cardiac asthma	None
Palpitation	Common	Frequent and severe	Frequent	None	None
Pulse	Full, strong, high tension	Feeble, may be irregular and intermittent	Small and irregular in mitral; jerking in aortic disease	May be very slow or rapid, often irregular	During attacks, feeble, irregular, or intermittent
Syncope	None	None	None	May be frequent	May occur during attacks
Dropsy	None	Generally present	Common	Rare	None
Position of apex	Strikes to left and below nipple	Displaced outwards	Position depends on state of ventricles	Often difficult to discover	May be normal
Impulse of heart	Strong and heaving	Diffused. Often irregular and intermitting	Depends on state of ventricles	Very feeble	May be normal but weak
Dulness on percussion	Area increased, shape of dulness varies	Area increased. Usually extends beyond nipple	Depends on state of ventricles	May be normal	May be normal
Sounds of heart	First sound dull and long, second accentuated	First like normal second sound often murmurs	Murmur depends on valve affected	Very feeble, may be inaudible	Weak but normal during attacks

CHAPTER III

DISEASES OF THE VESSELS (ANEURYSM)

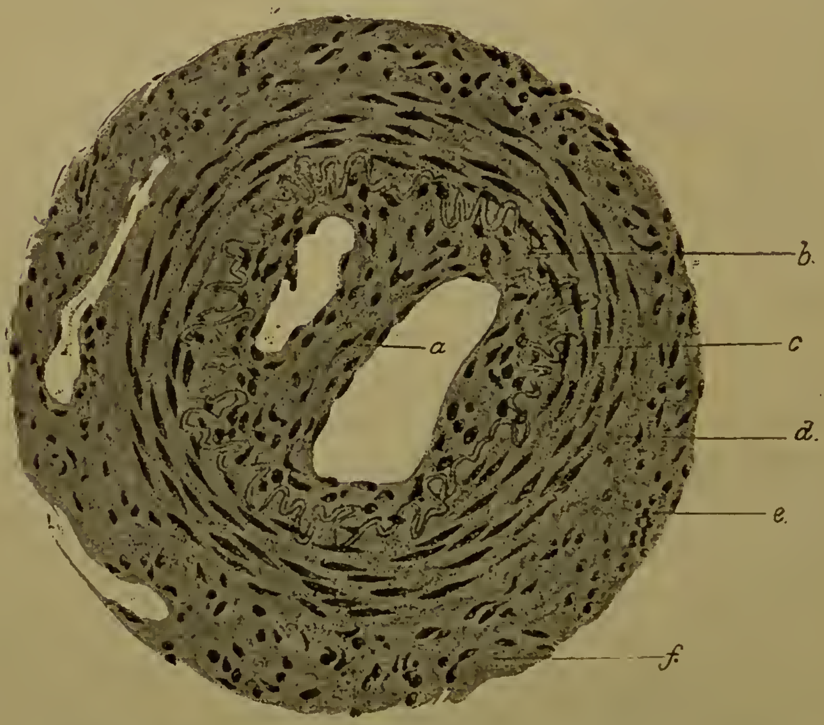
The principal diseases of the arteries are: (1) chronic endarteritis (atheroma); (2) endarteritis obliterans; (3) fatty degeneration; (4) calcareous degeneration; (5) aneurysm.

78. *Atheroma* chiefly occurs after middle age, or as a result of alcoholism, gout, syphilis, or kidney disease. It is most common in the aorta, either just above the heart, at the flexures, or around the orifices of its principal branches. The first sign of the disease consists of small, elevated, white patches upon the inner surface of the vessel, which are hard to the touch and cut like cartilage. Under the microscope an active proliferation of the cells in the deeper layers of the intima may be observed, the products of which accumulate and distend the inner coat. At a later stage the disease exhibits a yellow colour, owing to fatty degeneration of the newly formed cells. In some cases the pulpy material which is thus formed bursts through the endothelium, leaving a small cavity in the substance of the inner coat of the vessel (atheromatous abscess). In others the tissue becomes infiltrated with lime salts, and the superficial layers eventually scale off and produce an excavation of the wall (atheromatous ulcer).

The *effects of atheroma* upon a vessel are: (1) To narrow its calibre, interfering with the nutrition of the tissues supplied by it, and favouring coagulation of blood in its interior (gangrene, thrombosis); (2) to lessen its power of contractility; (3) to produce rigidity of its coats and to cause them to become brittle and easily torn (hæmorrhage); (4) to weaken its wall, so that it bulges before the pressure of the blood (aneurysm).

79. *Endarteritis obliterans* is a concentric thickening of the inner coat of an artery, whereby its lumen becomes gradually obliterated. (See fig. 16.) It is most common in the vessels of the brain, and is usually the result of syphilis. It is also met with in the lung, kidney, and other organs affected with chronic interstitial inflammation. The disease tends to diminish the nutrition of the surrounding tissues and often terminates in thrombosis.

FIG. 16.



Section of small artery affected with endarteritis obliterans. *a.* Thickening of subendothelial and endothelial tissues. *b.* Yellow internal elastic lamina. *c.* Well-marked muscular coat. *d.* External elastic lamina. *e.* Adventitia increased in thickness. *f.* Epithelium of one of the straight tubules of the kidney. (DR. SIMS WOODHEAD.)

Fatty degeneration is often mistaken for atheroma. It is most common in the aorta and pulmonary artery, and affects the cells of the intima. The disease is found in anæmic and emaciated persons, and often co-exists with fatty degeneration of the heart.

Calcareous degeneration affects the middle coats of the medium-sized arteries and converts them into rigid and brittle tubes. In rare cases *bone* may develop in the wall of the vessel.

80. An *aneurysm* is a localised dilatation of a vessel. The dilatation may affect the greater part of the circumference of an artery, and thus form a spindle-shaped or *fusiform aneurysm*, or it may produce a pouch at one spot, to which the term *sacculated aneurysm* is applied. The causation of aneurysm is to be found in (1) an enfeebled condition of the muscular wall of the vessel, arising from atheroma; (2) an abnormally high blood pressure due to physical overstrain (porters, labourers, athletes), or to chronic disease of the kidney. It is probable that the disease is often started by a sudden effort causing rupture of the diseased inner coat. As a rule an aneurysm continues to dilate until it bursts, but sometimes a natural cure is brought about by the deposit of lamellated blood clot upon the inner surface of the sac.

81. The diagnosis of aortic aneurysm is often very difficult, and not infrequently you have to surmise its presence from the absence of all other morbid conditions capable of giving rise to the symptoms of the patient. When the aneurysm has proceeded so far as to form a tumour on the chest, its detection is easy. You then find a pulsating tumour, the force of the impulse being usually greater than that of the healthy heart. It is dull on percussion, often accompanied by a systolic, in some cases also by a diastolic murmur, and is most generally situated on the right side of the sternum, in the second intercostal space. In others, although no distinct tumour is present, you may discover a part of the chest over the aorta which is dull on percussion, and you may hear a murmur at this spot. (Fig. 17.)

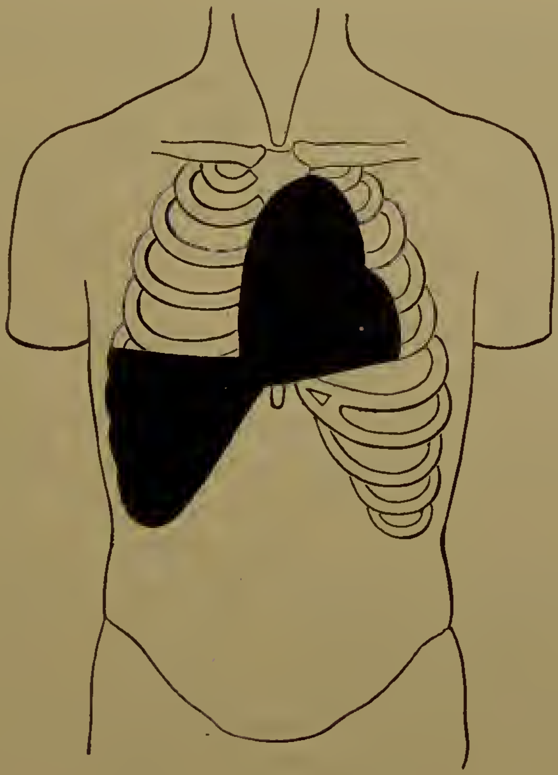
Thoracic aneurysm is usually met with in males, and is most apt to occur between thirty and fifty years of age. Persons subject to gout, or those who have suffered from syphilis, seem to be especially liable to it, and in many cases the first symptoms follow a sudden strain or injury to the chest.

Pain is a prominent symptom and is rarely absent, although it varies in severity in different cases, according to the situation of the tumour. In some it is of a neuralgic character, affecting the chest, neck, shoulders or arms, whilst in others, and especially where it is the result of pressure upon the spine, ribs or sternum, it is more localised, is increased by exertion or excitement, and relieved by rest in the recumbent position. Occasionally, severe attacks of angina constitute the prominent symptom.

As a rule, the other symptoms of aortic aneurysm are the result of pressure upon the neighbouring structures, and they therefore vary according to the site of the tumour. Cough is almost always present; it may be more or less constant, or it may occur in paroxysms. Expectoration usually accompanies the cough; it generally consists of mucus, but not infrequently attacks of hæmoptysis take place from time to time. Dyspnœa is a common symptom, and arises from pressure on the trachea or bronchial tubes. It often occurs in paroxysms of great severity which may be relieved or aggravated in certain positions of the body. Difficulty of swallowing may take place from obstruction of the œsophagus. In many cases this varies greatly in degree; at one time of the day the patient may be able to take solids, while at another even liquids can scarcely be swallowed. Not infrequently the voice alters, and becomes harsh, whispering, or shrill, from the pressure on the left recurrent nerve producing paralysis of one of the vocal cords, but you will find great variations in tone at different times.

In all doubtful cases you should examine the larynx with the laryngoscope, so as to ascertain if there is a loss of movement in one of the cords. A contracted or dilated state of one pupil is sometimes present from pressure on the sympathetic. An inequality between the pulses in the carotid, subclavian, or radial arteries is a very valuable sign, the most certain indications of which are given by the sphygmograph. The veins of one side of the chest or neck may be greatly swollen, and this frequently gives the first hint of the true nature of the case.

FIG. 17.



Pulsating tumour; dulness on percussion; murmur; often diminished respiration, and paralysis of the vocal cord on the affected side.

Diagram of a case of aortic aneurysm that projected on the left side of the chest, the heart being also enlarged. The dark shading shows the extent of dulness on percussion over the tumour, heart, and liver.

82. When the ascending portion of the aorta is the seat of the aneurysm you generally find an expansile, pulsating tumour in the second or third right intercostal space, dull on percussion, sometimes presenting a thrill on palpation,

and usually a systolic murmur on auscultation. The veins of the neck and chest are often enlarged; œdema of the neck and arm may be present. There may be a difference in the strength of the pulse at the wrists, or the respiratory murmur may be louder on one side of the chest than on the other. As the tumour increases absorption of the ribs is produced by its pressure, the skin becomes smooth and glossy, the veins over it enlarged, and, if the life of the patient is sufficiently prolonged, repeated bleedings may occur from congestion of the surface.

At an early stage, when the pulsation is weak, you may sometimes detect it by placing the palm of one hand on the front and the other on the back of the chest, whilst you direct the patient first to draw a full breath and then to expire as fully as possible.

83. In case of the transverse portion of the arch being implicated, a pulsating tumour may present itself at the root of the neck, but more generally it is absent; there is usually dulness over the upper bone of the sternum, and a systolic murmur may be detected in that situation. The veins of one side of the neck are often enlarged, and there is a marked difference between the radial pulses, or both are unusually small and feeble. The voice is altered from pressure on the recurrent nerve; dyspnœa is constant from pressure on the trachea, and is often aggravated by attacks of spasm, the pupils are frequently unequal. In some cases when the patient is sitting or standing with his mouth closed and his chin raised to its fullest extent, and you elevate the cricoid cartilage with the fingers, you can feel the pulsation communicated by the aneurysm.

84. When the aneurysm is situated in the descending portion of the aorta the diagnosis is generally very difficult. The patient, however, usually complains of fixed pain at the angle of the left scapula, and there is often a difficulty in the swallowing of solid food. There is rarely a pulsating tumour until a late period of the case, and the pulsation is often more readily seen than felt. You will often find it

an advantage to paste pieces of paper or a feather over the part and view them from one side. By this means you may detect a heaving motion when you are unable to feel it. There may be dulness on percussion near the spine accompanied by a murmur, but the pulses at the wrist are not altered, unless there is also disease in the vessel nearer the heart.

85. You may confound malignant disease of the lung or mediastinum with aneurysm of the thoracic aorta, as in both there may be dulness on percussion and the symptoms may indicate pressure on the neighbouring structures. In cancer, however, the progress of the case is much more rapid and the loss of strength and flesh much greater and more continuous. There is rarely any pulsation in cancer, or if so, it is not expansile, rarely a murmur or accentuated second sound, and, although the veins may be enlarged, the pulses at the wrist are equal on both sides. In cancer there are generally enlarged glands in the neck and axilla, or there may be evidences of malignant growths in some other organ of the body.

86. In rare cases of empyema pulsation may exist along with dulness on percussion, and you may consequently be led to suspect aneurysm of the descending aorta. But in such cases there will be a history of acute pleurisy. The pulsation is always on the left side near the spine, and the disease generally occurs in young persons in whom aneurysm is uncommon. The amount of dulness is much greater and the force of the pulsation much less than in aneurysm, whilst the heart is usually displaced to the right side of the chest.

87. In dilatation of the aorta you have not the signs of pressure that you encounter in sacculated aneurysm, but you may detect the presence of dilatation by an increased pulsation and a thrill above the notch of the sternum. In other cases you may suspect it from the presence of a loud, almost metallic second sound of the heart in a person whose radial arteries are thickened and diseased.

SYMPTOMS AND PHYSICAL SIGNS OF CHEST TUMOURS SIMULATING AORTIC ANEURYSM.

	Aortic Aneurysm.	Solid Tumours.	Pulsating Empyema.
Etiology	Occurs in middle age. After syphilis, gout, and injuries.	In middle age. Often other organs affected	Mostly young persons. History of pleurisy.
Pain	Generally severe	Generally severe	May be absent
Cough	Often severe and laryngeal	Often severe	Not severe
Dyspnœa	Severe, often paroxysmal	Severe, often paroxysmal	Often present but not paroxysmal
Hæmoptysis	Occasional	May be constant	None
Dulness on percussion	Usually marked, and in course of aorta	Usually marked, rarely in course of aorta	Usually on left side at base
Pulsation	Well marked, heaving.	Usually absent	Present but not heaving
Murmurs	Usually distinct	Usually absent	Absent
Changes in pulses	Pulses at wrists often unequal	Difference rarely present	No difference
Enlargement of veins	Often present	Often well marked. May be œdema	Absent
Difference in respiratory murmur	Often absent on one side or part of one lung	Often absent on one side or part of one lung	Absent only over the part dull on percussion
Alteration of voice	Often present	Often present	Absent
Enlargement of glands	Absent	Often present	Absent
Course	Usually slow	Usually rapid	May show little progress

CHAPTER IV

DISEASES OF THE LARYNX

The principal diseases of the larynx are—(1) acute and chronic catarrh; (2) membranous inflammation; (3) œdema of the glottis; (4) ulcerations; (5) tumours.

88. In *acute catarrh* the mucous membrane is swollen, red, and covered with mucus. The complaint arises from: (1) infectious fevers, such as typhoid, measles, pertussis, &c.; (2) inhalation of irritant gases such as chlorine, ammonia, &c.; (3) extension of inflammation from the pharynx; (4) diphtheria. It may subside, become chronic, or lead to œdema of the glottis. *Chronic catarrh* gives rise to thickening of the mucous membrane and stiffness of the movable parts of the larynx, so that the voice becomes hoarse and weak. Occasionally ulceration occurs upon the epiglottis or ary-epiglottic ligaments.

89. *Membranous laryngitis* is characterised by the formation of a false membrane in the interior of the larynx and trachea. As a rule the disease is due to diphtheria, but occasionally the inflammation may be non-specific in its origin (croup). In the early stages the mucous membrane is swollen, red and glazed in appearance. Subsequently a grey-white membrane forms over the affected parts, which is capable of being detached in strips. It consists of fibrine, leucocytes, bacteria and cocci. The disease is apt to extend to the bronchial tubes, and may give rise to (1) obstruction of the glottis; (2) pneumonia; (3) collapse of the lung.

90. In *œdema of the glottis* the submucous tissue of the

epiglottis and false cords is infiltrated with fluid, which causes the parts to become greatly swollen. It may ensue from (1) acute inflammation of the larynx (simple, pustular in small-pox, diphtheritic); (2) syphilitic or tubercular ulceration; (3) extension of inflammation from the perichondrium or pharynx; (4) kidney disease. Unless promptly treated it causes fatal obstruction of the glottis.

91. *Ulceration of the larynx* may be due either to tubercle or syphilis. In the former case the submucous tissue is infiltrated with tubercules which caseate and cause ulceration of the mucous membrane and finally destruction of the vocal cords. The disease is usually secondary to phthisis. In the latter the tissues of the epiglottis and larynx are infiltrated and thickened, and are finally destroyed by a process of ulceration. When healing occurs the contraction of the cicatricial tissue leads to deformity and obstruction of the glottis.

92. The chief tumours of the larynx are papillomata, fibromata, mucous polypi, sarcomata and cancers.

93. The laryngoscope is necessary for the examination of the larynx and trachea. It consists of a concave mirror, which is either fixed in a spectacle frame, or is attached to the forehead by an elastic band, and of a smaller mirror mounted on a long handle.

The patient must be placed upon a chair, with a lamp on one side and a little behind him, his neck inclined slightly backwards, and the face turned a little upward. Seat yourself opposite to him, with the concave mirror adjusted to your eye or forehead, according to the way in which it is mounted, direct him to open his mouth widely, and throw the light reflected from the mirror into the fauces, so that the centre of the disc may correspond with the base of the uvula. Grasp the end of his tongue with the thumb and forefinger of your left hand, enveloped in a fold of soft cloth or towel, gently draw it from the mouth and hold it steadily. Next warm the surface of the small laryngeal mirror for a few seconds over the lamp, and touch your own cheek with the back of it to prove that it is not too hot. Holding its handle in the right hand like a pen, pass it into the fauces, slightly raise upwards the uvula with its back, direct the light reflected from the concave mirror upon its surface, request the patient to draw a full breath, and then to say "ah," and you will see upon the laryngeal mirror a view of the interior of the larynx.

94. In a healthy larynx you will observe that the colour of the mucous membrane is slightly red, and that the vocal cords are white. The following drawings (figs. 18 and 19) show the various parts visible with the laryngoscope. When you suspect disease of the larynx, first remark the colour of the mucous membrane and if there are any ulcerations; see if there is any tumour, either in the neighbourhood of the glottis or upon the vocal cords; afterwards, by directing the patient to say "ah—eh," you will be able to ascertain whether the vocal cords approximate during speech in the normal manner.

SECTION I

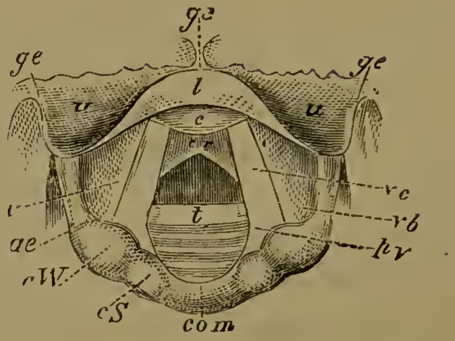
ACUTE DISEASES OF THE LARYNX

95. *a.* The patient is attacked with pain or uneasiness over the larynx, hoarseness or complete loss of voice, cough, at first dry, but afterwards attended with a mucous expectoration. The temperature is slightly raised. When the laryngoscope can be employed, the epiglottis and the mucous membrane of the larynx are seen to be of a bright, red colour.

The disease is *acute laryngeal catarrh.*

The catarrh first affects the nares and the pharynx. It is usually the result of cold, but persons addicted to the excessive use of alcohol or tobacco, or who are exposed to irritating dust of any kind, are especially liable to it. In children the symptoms are generally more severe than in

FIG. 18.

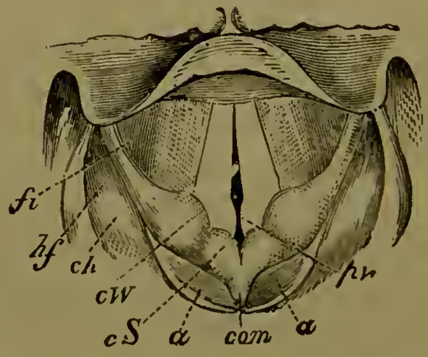


Laryngoscopic drawing, showing the vocal cords drawn widely apart, and the position of the various parts above and below the glottis during quiet inspiration.

g. e.	Glosso-epiglottidean folds.
u.	Upper surface of epiglottis.
l.	Lip of epiglottis.
c.	Cushion of epiglottis
v.	Ventricle of larynx.
a. e.	Ary-epiglottidean fold.
c. W.	Cartilage of Wrisberg.
c. S.	Capitulum Santorini
com.	Arytenoid commissure.
v. c.	Vocal cord.
v. b.	Ventricular band.
p. v.	Processus vocalis.
c. r.	Cricoid cartilage.
t.	Rings of trachea.

(SIR MORELL MACKENZIE.)

FIG. 19.



Laryngoscopic drawing, showing the approximation of the vocal cords and the position of the various parts in the act of vocalisation.

f. i.	Fossa innominata.
h. f.	Hyoid fossa.
c. h.	Cornu of hyoid bone.
c. W.	Cartilage of Wrisberg.
c. S.	Capitulum Santorini.
a.	Arytenoid cartilages.
com.	Arytenoid commissure.
p. v.	Processus vocalis.

(SIR MORELL MACKENZIE.)

the adult. They are usually attacked suddenly during the night with loud, croupy cough and difficulty of breathing; the face is flushed, the skin hot, the pulse rapid. After a few hours the distress usually subsides, but the complaint may recur from time to time.

96. *b.* A child is affected with loud metallic cough, crowing inspiration, hoarse voice, dyspnœa, rapid breathing aggravated in paroxysms, quick pulse, thirst, and a hot dry skin.

The disease is *membranous croup.*

The dyspnœa arises, not only from the presence of a false membrane in the larynx, but also from spasm, or, as some assert, from paralysis of the muscles of the larynx, set up by the inflammation. An attack is usually preceded for a day or two by slight cough and feverishness, but the characteristic cough and dyspnœa usually make their appearance suddenly during the night. In fatal cases the dyspnœa increases, the respiration becomes quick and laboured, the pulse small and thready, the face pale, the lips blue; death is often preceded by convulsions. In some cases cylindrical casts of the trachea are expelled by coughing.

Membranous croup is a disease confined to childhood, but in the adult a diphtheritic affection of the throat may spread to the larynx and produce a similar condition. Membranous croup is generally believed to be of a diphtheritic nature, although pathologists are not as yet agreed upon this point. Any portions of membrane that may be rejected should be examined to ascertain if the micro-organisms characteristic of diphtheria are present (see Diphtheria).

97. It is always most difficult, and it may be impossible, to distinguish at first between an attack of acute laryngeal catarrh and membranous croup in the child. In the former the symptoms usually occur suddenly and are severe at their onset, and the temperature is considerably raised. In membranous croup the cough and dyspnœa come on more gradually, the temperature may be little above the normal,

and there may be patches of membrane on the tonsils or pharynx, or particles of membrane may be expectorated.

98. *Laryngismus stridulus* is a term applied to a spasmodic affection of the windpipe, to which young infants are subject. The child awakes from its sleep, or is suddenly attacked when awake, with a loud crowing inspiration which may last for several minutes, and then disappear as rapidly as it came on; in other cases death occurs during the attack from suffocation. It is a nervous disorder, and is liable to recur frequently, being excited by various causes of irritation acting on the nervous system. It most frequently attacks children who are teething, and those brought up by hand, or who are affected with rickets. It is readily distinguished from true croup, by the suddenness and short duration of the attack, and by the absence of cough, fever, or alteration of the voice.

SECTION II

Chronic Diseases of the Larynx

99. *a.* The patient has for a long time suffered from cough, expectoration, hoarseness or loss of voice. When examined with the laryngoscope the mucous membrane of the larynx, or a portion of it, is abnormally reddened, dry, or covered with mucus, or it may present small ulcerations in different parts.

The disease is *chronic catarrh of the larynx.*

Chronic inflammation of the larynx may commence as an acute affection, but in most instances the symptoms come on gradually. It is most common in those who habitually have to exert their voice loudly, but it also is liable to affect persons suffering from phthisis or syphilis, and those who indulge to excess in the use of alcoholic stimulants or of tobacco smoking.

100. In cases of phthisis it almost always follows an

affection of the lungs and adds greatly to the sufferings of the patient, by increasing the violence of the cough and by causing excessive pain at every attempt to swallow food. Whenever, therefore, you meet with a case of long duration, carefully examine the chest and the expectoration for evidences of tubercular disease.

It occasionally results from congenital syphilis, but usually it is the consequence of acquired syphilis. The history of the case is the best guide to your diagnosis.

101. *Perichondritis* of the larynx very rarely occurs, but when it does, it is usually the result of a syphilitic or tubercular affection of the part. There are usually in the first stage pain, cough, loss of voice and difficulty in swallowing, and, afterwards an abscess forms, great dyspnœa occurs and fragments of the affected cartilage may be expectorated.

102. *b*. The patient has been suddenly attacked with severe, suffocating dyspnœa, the voice is hoarse or lost, the inspiration stridulous. The epiglottis may be often felt by the finger, or can be seen to be large and swollen when the tongue is depressed with a spatula.

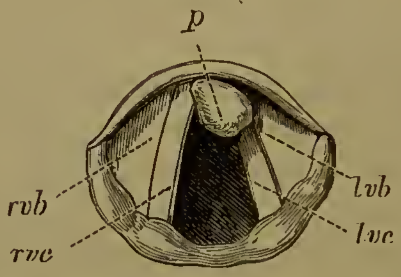
The disease is *œdema of the glottis*.

Œdema may exist as an acute or chronic affection. When acute, it may arise from the contact of boiling water or of some corrosive fluid ; it may follow scarlatina, erysipelas of the head and neck, or it may be the result of an acute or chronic disease of the kidneys. When chronic it is most frequently caused by disease of the cartilages ; in either case its symptoms are distressing, and its issue often fatal. There are generally present intense dyspnœa, hoarseness or loss of voice, harsh, barking cough, and difficulty of swallowing. The inspiration is loud and noisy, whilst the expiration is tolerably easy.

103. The symptoms of œdema are very similar to those of croup, but croup usually attacks children who are in good health, or who are recovering from eruptive fevers ; œdema takes place chiefly in adults who are already the

subjects of laryngeal disease, who have suffered from one of the eruptive fevers or from disease of the kidneys. The symptoms of œdema come on more rapidly than those of

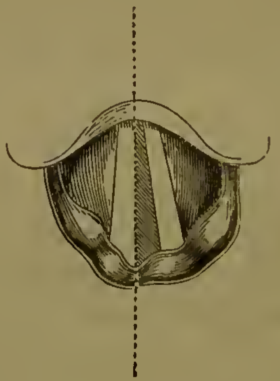
FIG. 20.



A small polypus attached just above the anterior insertion of the vocal cord.

r. v. b. Right ventricular band.
r. v. c. Right vocal cord.
l. v. b. Left ventricular band.
l. v. c. Left vocal cord
p. The tumour.
(SIR MORELL MACKENZIE.)

FIG. 21.



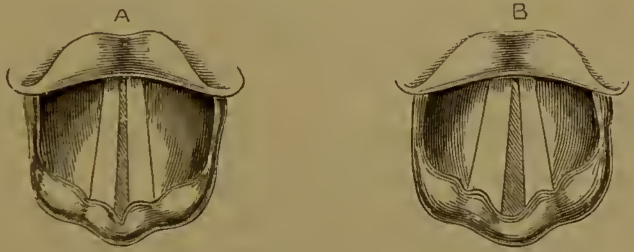
The appearance presented in a case of paralysis of the adductor of the left vocal cord, when the patient attempted to speak. The left vocal cord was not adducted to the median line: consequently a space remained between the vocal cords, and the voice could not be sounded. (SIR MORELL MACKENZIE.)

croup, and the swelling of the epiglottis can be usually detected by the finger or the laryngoscope.

104. Various forms of tumours occur in the larynx, chiefly in the vicinity of the vocal cords; they are often of a warty or fibroid character (see fig. 20); in other cases they arise from hypertrophy of the mucous follicles.

105. Different kinds of malignant tumours are liable to present themselves in the larynx, generally commencing at or near the vocal cords. In the early stage it may be impossible to distinguish them with the laryngoscope from other tumours, but ulceration soon takes place, pus, or pus mixed with blood, or blood alone, is coughed up, and in many cases the breath becomes very fœtid. Small particles of the tumour are sometimes expelled and their nature can be recognised by the microscope. There is often great pain, either referred to the seat of the disease, or shooting upwards to the ear, neck and head, and the patient, as in malignant disease of other organs, rapidly loses flesh and strength.

FIGS. 22 and 23.



The appearances presented in a case where the adductors of both vocal cords were paralysed.

A. inspiration. | B. Forced expiration.

(SIR MORELL MACKENZIE).

106. *c*. One or both vocal cords are motionless, and remain stationary at the side of the larynx when the patient attempts to speak, although the parts seem otherwise normal. The voice is lost, or whispering.

The disease is named *aphonia*.

Aphonia must not be confounded with *aphasia*. The former consists in a mere inability to use the vocal cords in speaking; the latter arises from an injury to that part of the brain whose function it is to express thoughts by words (see Aphasia).

107. If both vocal cords cannot be drawn to the median

line of the larynx when the patient attempts to speak, the complaint arises from paralysis of the *adductors* of the vocal cords (crico-arytenoidei laterales, and the arytenoideus proprius). This condition usually arises from debility or hysteria, but in other instances it is the result of phthisis or catarrh. When only one cord moves in the attempt to speak, the crico-arytenoideus lateralis of the opposite side is paralysed (see fig. 21). The most common causes are lead-poisoning, syphilis, diphtheria, or phthisis, but occasionally it results from disease of the brain.

108. *d.* The patient suffers from great difficulty of breathing, increased on the slightest exertion, and one or both of the vocal cords remain motionless when a full inspiration is taken.

The disease arises from *paralysis of the abductors of the vocal cords*—(crico-arytenoidei postici).

It is rare to find the abductor muscles of both sides paralysed, but it does occasionally occur in disease of the brain. When one side is alone affected, it is usually the result of the compression of the recurrent nerve by an aneurysm, or a tumour of a glandular or cancerous nature.

109. The voice may be lost or greatly altered in tone by paralysis of the tensors (crico-thyroidei), or of those whose office it is to relax the vocal cords (thyro-arytenoidei). In the former case the surface of the cords seems to be not quite horizontal and their edges are not perfectly straight; in the latter a minute elliptical opening may often be discovered between the cords.

CHAPTER V

DISEASES OF THE LUNGS

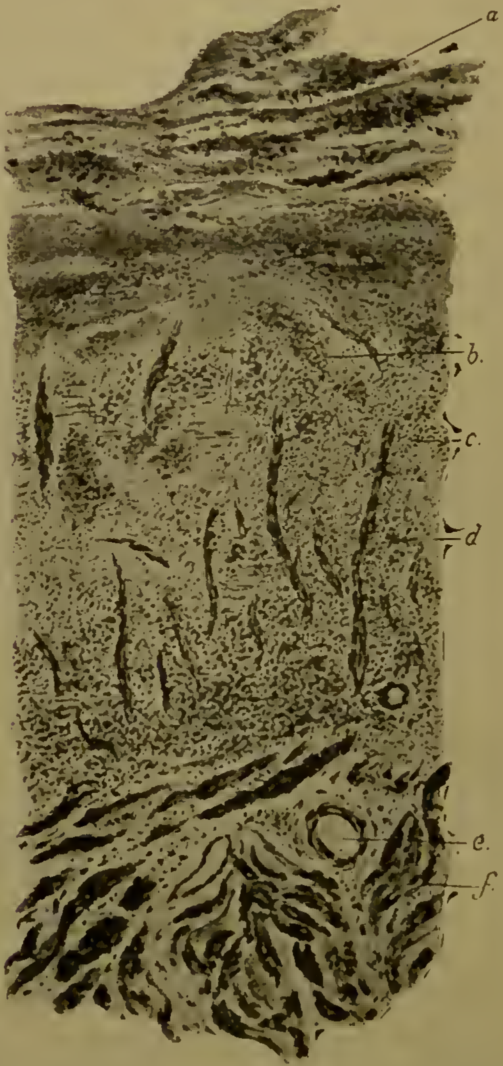
The principal morbid conditions affecting the pleura are, pleurisy, hydrothorax, pneumothorax, tubercular and cancerous growths; those of the lungs are bronchitis, dilatation of the bronchi, emphysema, congestion, pulmonary apoplexy, pneumonia, tuberculosis, and cancer.

110. Pleurisy, or inflammation of the pleura.—In the first or dry stage the surface of the membrane is red, roughened, and covered with a layer of lymph or semi-gelatinous matter. This stage may terminate by recovery or by adhesion of the opposite sides of the pleura; but generally a turbid fluid, mixed with flakes of coagulated lymph, is also effused; in certain cases this serous fluid becomes converted into pus (empyema).

Microscopically, the first change in acute pleurisy consists in dilatation of the capillaries of the serous membrane, producing the redness visible to the naked eye. The epithelium falls off, leaving the membrane roughened, and the bare surface becomes covered with lymph exuded from the dilated bloodvessels. The exudation consists of a network of fine fibrils enclosing a large number of cells. The fibrils are composed of fibrine derived from the coagulation of the plasma, while the cells consist of red and white corpuscles from the blood mixed with others arising from the proliferation of the cells of the connective tissue. If the opposed surfaces of the inflamed membrane remain in contact, the exudation becomes gradually organised, and the two surfaces of the pleura become united by a layer of connective tissue, which constitutes what are termed "adhesions" (fig. 24).

The first effect of pleurisy is to set up fever; afterwards, if the amount of effusion be large, the walls of the chest are pushed outwards. The lung is compressed against the spine,

FIG. 24.



Section of an inflamed serous membrane. *a.* Network of lymph on surface. *b.* Lymph in which organisation is commencing. *c.* Newly formed vessels. *c.* Larger vessel. *f.* Myocardium.
(DR. SIMS WOODHEAD.)

is flattened, reduced in size, and feels tough and leathery; its outer surface is coated with lymph, and, on being cut into, its texture appears to be void of air. The opposite lung is usually much congested. If the effusion be on the right side, the diaphragm and liver are displaced downwards; if on the left, the heart is pushed to the right side of the chest, and the stomach and spleen are depressed. If the fluid is absorbed and the lung is incapable of expansion, the whole of the affected side contracts and the spine presents a lateral curvature.

The chief causes of acute pleurisy are: (1) exposure to cold; (2) Specific fevers, acute rheumatism, measles, smallpox, &c.; (3) extension of inflammation from the lung, chest wall, or peritoneum, such as pneumonia, caries, peritonitis; (4) septicæmia and pyæmia; (5) Bright's disease; (6) traumatism; fractured rib, stabs of the chest; (7) bursting of a pulmonary abscess or perforation of a gastric ulcer into the pleural cavity; (8) gout; (9) chorea; (10) cancer and tubercle. *Purulent effusion* usually ensues from direct infection of the serous membrane (6 & 7), Bright's disease, pyæmia, and is especially common in children. *Chronic pleurisy* is chiefly met with in gout, tuberculosis, and Bright's disease.

111. HYDROTHORAX, or water in the chest.—This is a form of dropsy in which a straw-coloured fluid is effused into the cavity of the pleura. The pressure of the fluid produces congestion of the lungs by preventing their free expansion. It is distinguished from pleuritic effusion by the absence of flakes of lymph, and of signs of inflammation of the pleura.

It usually occurs from disease of the heart, kidneys, or liver.

112. PNEUMOTHORAX, or air in the pleura.—This arises from a communication taking place between the bronchial tubes or air-cells of the lung and the cavity of the pleura. The immediate effect of the admission of air into the pleural cavity is to cause collapse of the lung and consequent

danger of suffocation. If the patient survives, inflammation is set up, lymph is effused, and fluid or pus collects in the pleural sac.

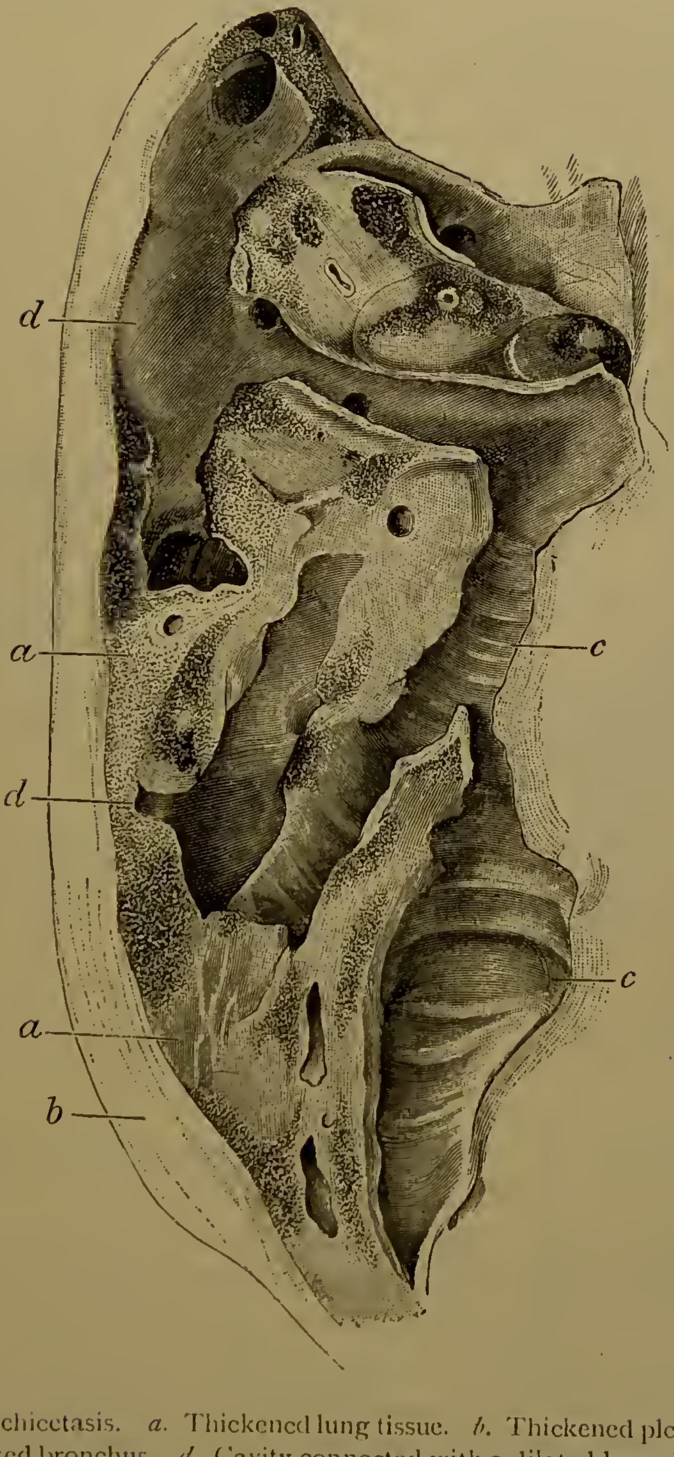
The causes of pneumothorax are: (1) rupture of a phthisical cavity; (2) bursting of an empyema through a bronchial tube; (3) rupture of an emphysematous vesicle; (4) abscess or gangrene of the lung; (5) cancer of the œsophagus communicating with the pleura; (6) ulcer of the stomach perforating the diaphragm; (7) abscess or hydatid cyst of the liver bursting into the colon and also into the chest.

113. BRONCHITIS, or inflammation of the bronchial tubes.—In the acute stage, the mucous membrane of the tubes is red, rough, soft, thickened, and covered with mucus or muco-purulent fluid; sometimes ulceration takes place. In chronic cases, the muscular structure undergoes hypertrophy and the tubes become thickened and dilated. Microscopically, the epithelium is shed at an early stage, and the basement membrane is considerably thickened. The deeper layers of the mucosa are infiltrated with round cells, and the mucous glands furnish an abundant secretion. In the chronic form of the disease, the formation of fibrous tissue causes atrophy of the mucous membrane and enfeeblement of the muscular coats of the bronchi.

When the smaller tubes are inflamed, the disease is termed *capillary bronchitis*, and the danger to life is in proportion to the minuteness of the tubes affected, because the inflammatory swelling is apt to choke up the openings into the air-cells, and thus prevent the due aeration of the blood. If the inflammation is due to the presence of a foreign body or of decomposing fluids, it is often suppurative in character (septic or fœtid bronchitis). Occasionally a fibrinous exudation takes place, and forms casts of the tubes (plastic bronchitis). Acute bronchitis in children and old persons often causes collapse of the air-cells or leads to catarrhal pneumonia.

The chief causes of bronchitis are: (1) exposure to cold or sudden atmospheric changes; (2) specific fevers, such as

FIG. 25.



Bronchiectasis. *a.* Thickened lung tissue. *b.* Thickened pleura. *c.* Dilated bronchus. *d.* Cavity connected with a dilated bronchus.
(ZIEGLER.)

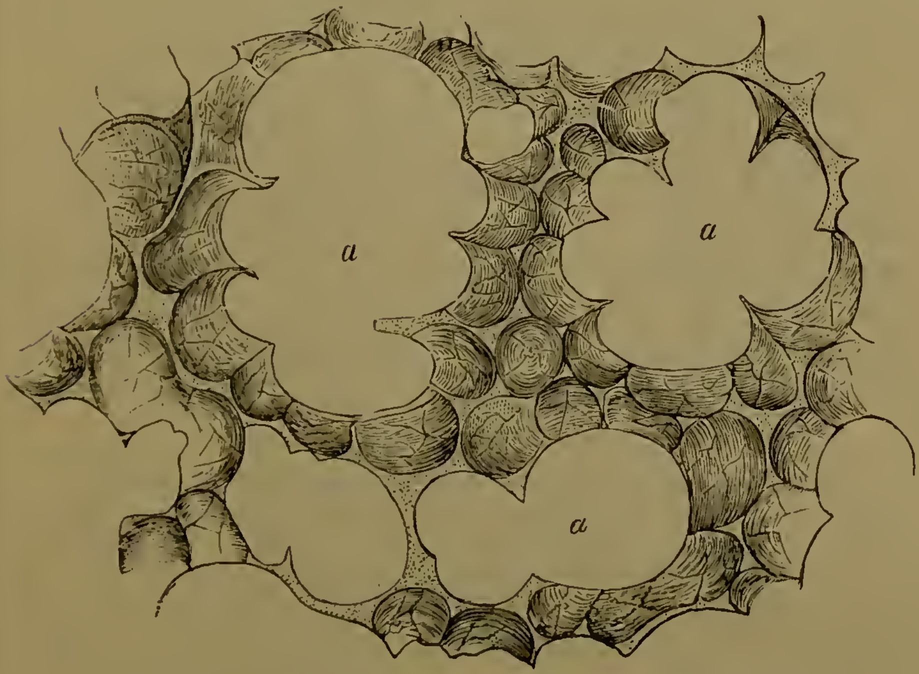
measles, influenza or whooping-cough; (3) inhalation of irritant dust or vapours; (4) congestion of the lungs from disease of the heart.

114. Bronchiectasis (Dilatation of the Bronchial Tubes).—This condition, which is a common result of chronic bronchitis and fibroid pneumonia, may occur in different forms. 1. The tubes of a portion of one lung may be uniformly dilated, their walls being either thickened or attenuated. 2. The dilatation may be isolated, of considerable size, round, or irregular in shape, connected with one of the larger tubes, and usually surrounded by condensed lung tissue. 3. There may be very numerous small round dilatations of the terminal branches of the bronchial tubes in a lung affected with emphysema or some other morbid condition (see fig. 25).

115. Emphysema.—There are two kinds of this disease—vesicular, in which the air-cells are dilated and a number of them merged into one; and interlobular, where the air has escaped into and distends the connective tissue of the lung. *Interlobular* emphysema occurs chiefly in childhood, and usually results from whooping-cough or capillary bronchitis. In *vesicular* emphysema the lungs are increased in volume and pale in colour, they do not collapse when the chest is opened, the air-cells are greatly dilated, and often appear like little bladders below the pleura. Microscopically, the infundibula and pulmonary alveoli are dilated. Two or more having come into contact, an opening takes place between them, and they are gradually fused into one. The pulmonary capillaries are, by the pressure of the dilated cells, gradually diminished in size, and may become impervious (see fig. 26).

The increased size of the lungs presses the ribs outwards so that the chest becomes barrel-shaped; it also pushes the diaphragm downwards. The loss of the elasticity of the lungs calls into play an increased action of the expiratory muscles, which become enlarged, and the blending together of many neighbouring air vesicles compresses the blood-vessels of the affected parts, and thus induces an obstruction to the circulation of the blood, which, in its turn, sets up hypertrophy of the right ventricle of the heart (fig. 2). The free edges of the lungs are chiefly affected by emphysema, consequently they overlap the heart, and occupy the upper part of the hepatic region. Vesicular emphysema is said to be *vicarious*, when the affected parts have become dilated to compensate for the collapse or imperfect expansion of some other portions of the lung that have been affected by previous disease. It is termed *substantive* when it occurs from causes primarily affecting the air-cells. For example, it takes place in whooping-cough, from violent expiratory efforts whilst the glottis is closed, and therefore the parts least supported, such as the apex and borders of the lung, are forcibly dilated. It is a common result of chronic bronchitis and of ossification of

FIG. 26.



Section of lung affected with emphysema. *a a a*. Dilated infundibula. (RINDFLEISCH.)

the costal cartilages. It is also met with in cases of gout and chronic arthritis. Occasionally fatty degeneration of the elastic tissue of the lung appears to be the cause of the dilatation of the alveoli.

116. Congestion of the Lungs.—This is one of the most common morbid appearances found after death. The lung is loaded with blood, is of a dark colour and heavy, but it crepitates under the finger and floats in water. Œdema, or dropsy of the lung, results from long-continued congestion; in this condition the lung is red and swollen, and, on being cut into, a large quantity of frothy fluid mixed with blood flows from the bronchial tubes and air-cells.

Congestion of the lungs may be active or passive. The *active* form occurs in all cases of inflammation of the pulmonary tissue, or when the circulation through other parts of the lung is embarrassed. *Passive* congestion occurs when the flow of blood from the pulmonary veins is obstructed, as in disease of the mitral valve, or from failure of the heart's action in fevers, &c., in which latter case it is named *hypostatic congestion.*

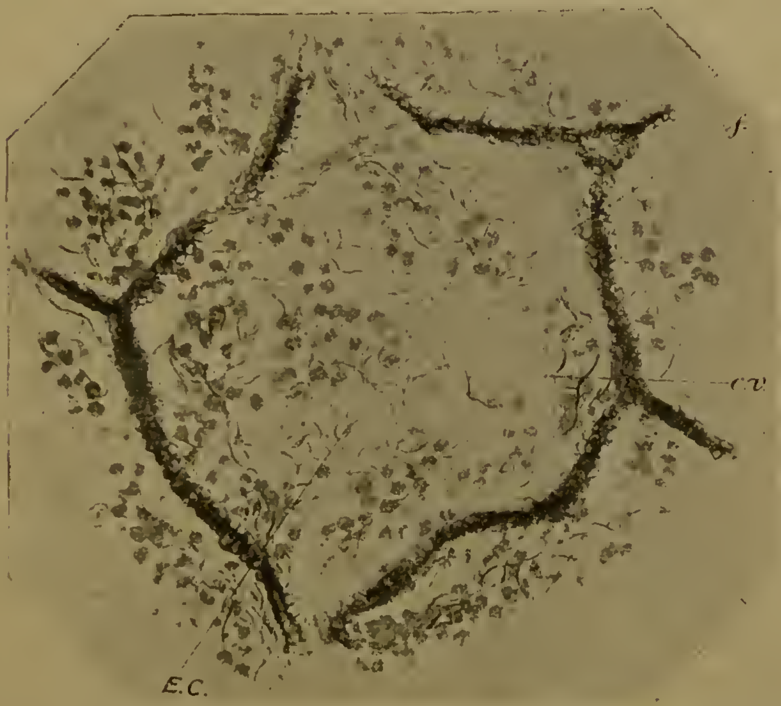
117. The term Brown Induration has been applied to a condition of the lung which arises from prolonged passive congestion. The whole lung is firmer than normal, and does not fully retract when the chest is opened. The colour is brown owing to an alteration in the composition of the blood effused into the interstitial tissue. Microscopically, the capillary vessels are found to be dilated and the cavity of the air-vesicles diminished. The interlobular connective tissue is much thickened.

118. Pulmonary Apoplexy.—The lung is of a dark colour, loaded with blood, and heavy. On making a section of it, numerous sharply defined black patches of extravasated blood are found, chiefly in the lower lobes. These are softer and more friable than the neighbouring parts, do not crepitate on pressure, and sink in water. Microscopically, the air-cells in the dark patches are found to be filled with coagulated blood. Pulmonary apoplexy almost

always results from disease of the heart, and notably from disease of the mitral valve, but it may also arise from embolism of the pulmonary artery by a piece of clot detached from a peripheral vein or the right ventricle.

119. PNEUMONIA, OR INFLAMMATION OF THE LUNG.—There are three forms of this disease, *croupous* or *lobar* *pneumonia*, *catarrhal* or *lobular*, and *chronic* or *interstitial pneumonia*.

FIG. 27.



Microscopical appearance of an air vesicle in red hepatisation. *c. v.* Bloodvessels in interalveolar septa. *f.* Filaments of fibrinous lymph attached to the wall of the air vesicle. *E. C.* Large nucleated epithelial cell. (DR. SIMS WOODHEAD.)

120. *Acute lobar pneumonia* usually affects one or more lobes of a lung, and is described as having three stages. First, *engorgement*; second, *red hepatisation*; third, *grey hepatisation*. In *engorgement* the appearances are those of an intense degree of congestion. In *red hepatisation* the

lung is somewhat enlarged; it is of a red colour, solid like liver, friable, heavy, sinks in water, and appears granular when cut or torn. Microscopically, in *red hepatisation* the air-vesicles are seen to be filled with an exudation composed of fine fibrils of fibrine, among which may be observed red and white corpuscles and a few endothelial cells (see fig. 27). The walls of the air-vesicles are somewhat swollen by the engorgement of the capillaries, and the smaller bronchioles are choked with plugs of lymph. In *grey hepatisation* the tissue is of a dirty-grey colour, solid, heavy, easily broken down by the finger, sinks in water, and a thick purulent fluid flows from it when squeezed. Microscopically, the alveoli are found to be distended with fibrine and leucocytes, the pressure of which has driven the blood out of the capillaries and rendered the tissue anæmic. Fatty degeneration and disintegration of the cells and fibrine results in the conversion of the exudation into an emulsion, which resembles pus in its naked eye appearances. This material is partly absorbed by the lymphatics and partly expectorated, so that eventually the lung is restored to its normal condition (resolution). In certain cases, however, purulent infiltration occurs with the production of an *abscess*, or the inflamed tissue becomes *gangrenous*.

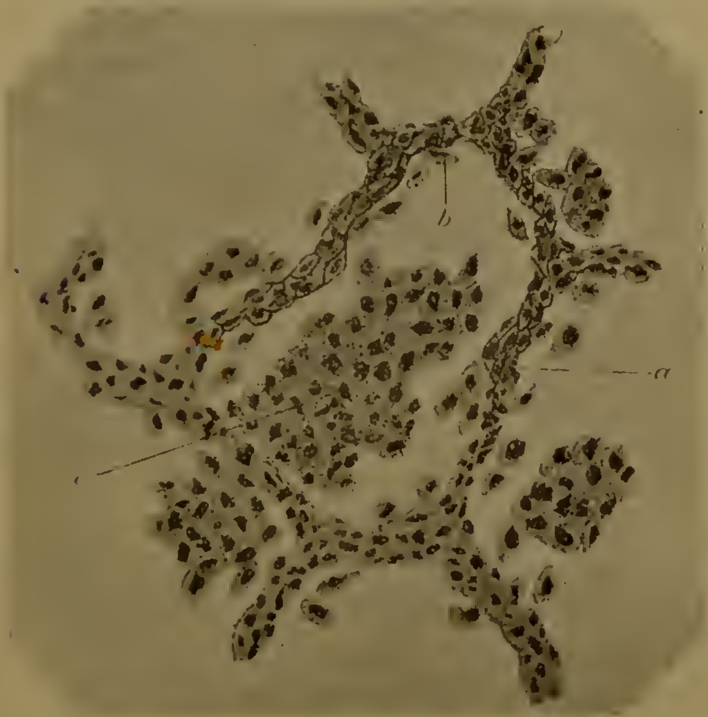
Chronic interstitial pneumonia occasionally results from inflammatory thickening of the walls of the alveoli. *Pleurisy* always accompanies acute inflammation of the lung, and *pericarditis* may be excited by extension of the disease.

Acute pneumonia is caused by the presence in the blood of certain forms of microbes, of which the diplococcus of Fränkel is the chief (fig. 36). It must therefore be regarded as an acute specific fever with a local manifestation. The poisonous products of the microbes give rise to secondary changes in the liver and spleen, with the occasional production of *herpes*, *jaundice*, and *albuminuria*.

121. ACUTE BRONCHO-PNEUMONIA, sometimes called catarrhal or lobular pneumonia, is frequently met with

in children who are suffering from capillary bronchitis. It is particularly common in measles, whooping-cough and typhoid. The disease is often limited to single lobules of the lung, which appear firm and of a red colour, and present a finely granular surface upon section. A purulent fluid oozes from the bronchial tubes when the tissue is squeezed. Under the microscope the terminal bronchi and the alveoli connected with them are seen to be filled with an exudation which consists partly of leucocytes and partly of endothelial cells derived from the walls of the air vesicles. In addition to these cells, red blood-corpuscles and fibrine are sometimes present (fig. 28). The disease is often associated with collapse of the pulmonary alveoli in

FIG. 28.



Microscopical appearance of an air vesicle in catarrhal pneumonia. *a.* Proliferating epithelial cells still attached to the inter-alveolar septa. *b.* Cell still held in position. *c.* Mass of catarrhal cells lying free in the alveolus. (DR. SIMS WOODHEAD.)

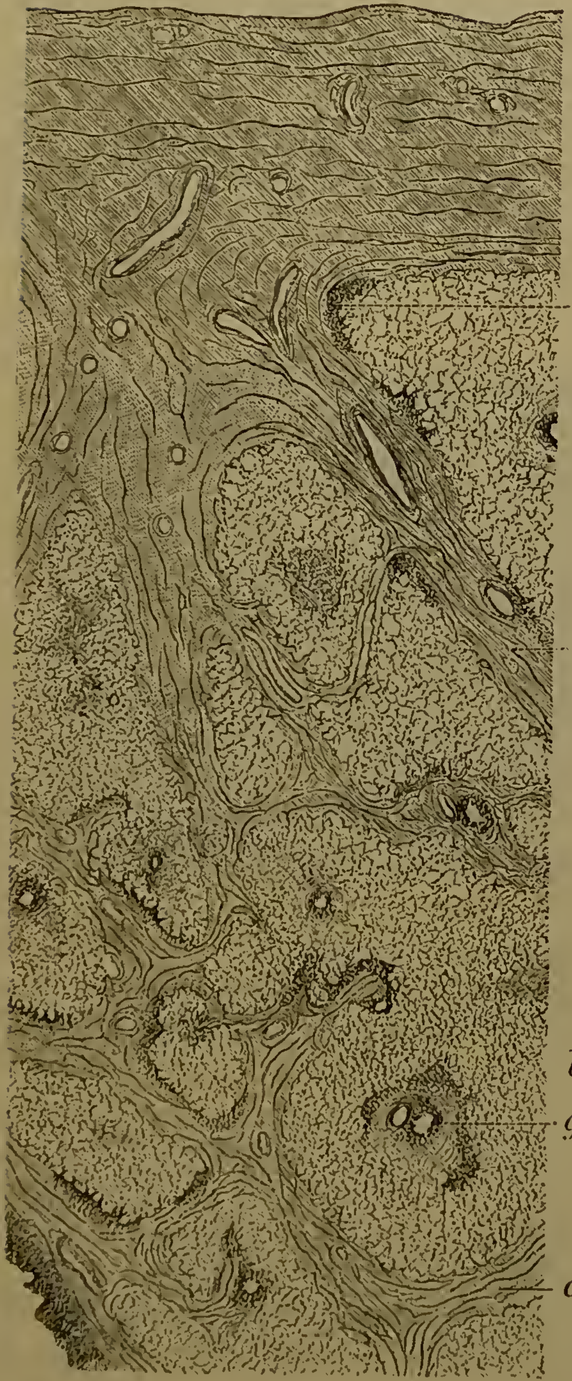
the neighbourhood and in many cases pleurisy accompanies the process.

122. CHRONIC INTERSTITIAL PNEUMONIA (FIBROID DISEASE OR CIRRHOSIS OF THE LUNG).—In this condition the substance of the lung is hard, dense, of a dark grey or black colour, traversed by whitish or black bands of fibrous tissue. The pleura is generally thickened, the bronchial tubes are dilated and their walls much hypertrophied. Retention and decomposition of their secretion is apt to produce ulceration with the formation of ragged cavities. Microscopically, the walls of the alveoli are greatly thickened by fibrous tissue. The epithelium of the air cells is usually preserved, but occasionally it exhibits catarrhal changes. Finally the contraction of the newly formed fibrous tissue destroys and contorts the substance of the lung, and causes obliteration of the air vesicles (fig. 29).

The disease may result from an attack of acute inflammation, or from the inhalation of irritant solid particles, such as occurs in the occupation of miners, millers, stonemasons, needle-grinders, &c.

123. TUBERCLE IN THE LUNG constitutes the disease named phthisis pulmonalis (consumption). Tubercle occurs in almost every organ of the body, but is most frequently met with in the lungs. It presents itself in three stages—*consolidation* or *deposition*, *softening*, *ulceration*. In the stage of *deposition* the tubercle may be scattered through the lungs in the form of small, round, hard, grey, semi-transparent granules (grey or miliary tubercles); or it may be present in the shape of hard, opaque, yellow, cheesy masses (crude or yellow tubercle). Sometimes the tubercle dries up into a chalky mass (obsolete tubercle). Generally it softens and inflammation is set up in the surrounding structures, which become congested, soft and friable. This is the second stage, or that of *softening*. *Ulceration* succeeds, and one or more ragged, irregular-shaped cavities are produced, constituting the third stage. The cavities may either increase in size, and be found after death filled with

FIG. 29.

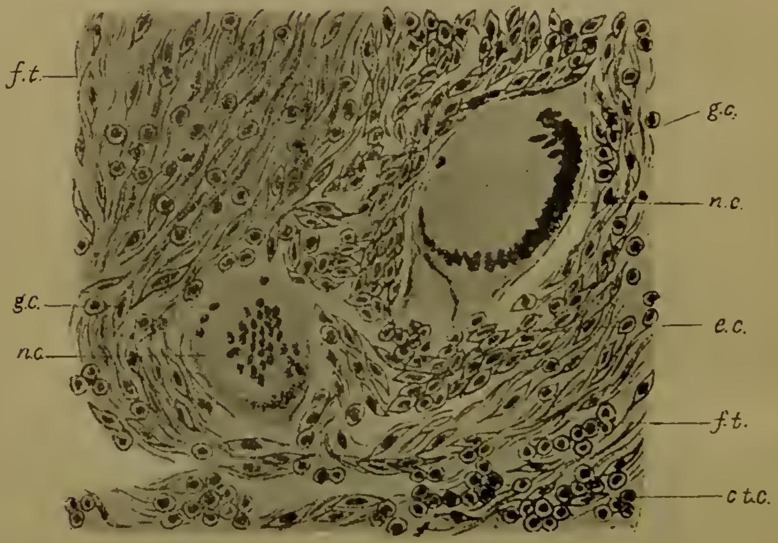


Chronic interstitial pneumonia. *a.* Thickened pleura. *b.* Pulmonary tissue. *c.* Thickened interlobular septa. *c.* Dilated bronchus. *g.* Bronchioles with infiltrated walls. (ZIEGLER.)

pus and disorganised lung tissue, or an attempt at cure may occur, in which case the inflammation of the surrounding structures subsides, and the cavity becomes lined with a smooth membrane.

The *miliary tubercle* commences in the connective tissue around the smaller bronchi and between the alveoli. The affected parts are infiltrated with leucocytes, which accumulate and obscure the surrounding structures. In the midst of these evidences of inflammation definite tubercles become visible. The centre of each consists of a giant cell containing many nuclei and often a considerable quantity of pigment. Around this may be seen a zone of large nucleated cells, and outside this again a number of small round cells. In many cases, however, the giant cell and the zone of leucocytes can alone be discriminated (fig. 30). In specially stained preparations tubercle bacilli can be seen.

FIG. 30.



Giant cells from a case of chronic tuberculosis of the lung. *g.c.* Branching giant cells. *n.c.* Nuclei of giant cell. *e.c.* Endothelial cells around giant cells. *f.t.* Fibrous stroma. (Dr. SIMS WOODHEAD.)

Acute miliary tuberculosis results from the entrance of tubercle bacilli into the general circulation. In this disease, not only the lungs, but the various serous membranes and other organs of the body are found after death to be studded with miliary granulations.

124. In *acute phthisis* the lung is solid. Scattered over its surface are large, rounded, pale yellow patches which on section present the appearance of bunches of grapes, of which the bronchioles form the stalks, and the consolidated lobules the clusters. These latter are cheesy in consistence, and here and there have undergone softening with the production of small cavities. When the section is squeezed, a thick muco-purulent material exudes from the bronchi, the walls of which are thickened and gelatinous. Interspersed among the caseous patches are clumps of miliary tubercles. The surface of the pleura is inflamed.

In *chronic phthisis* the pleura at the apex of the lung is thickened and adherent. The upper part of the lung contains one or more cavities, which vary in size from that of a hazel-nut up to that of a small orange. Each cavity has a firm fibrous wall, a smooth glistening lining, and usually contains soft caseous masses. Occasionally a small aneurysm projects into the cavity from a vessel situated in its wall. In the lower parts of the lung the other stages of the tuberculous process may be observed, namely, patches of caseation, and scattered miliary tubercles.

125. In *fibroid phthisis* the lung is condensed, tough and fibrous; the pleura is thick and adherent, and the tuberculous material is either infiltrated with lime salts, or has undergone fibroid degeneration.

The chief complications of chronic phthisis are (1) hæmoptysis; (2) pneumothorax; (3) tubercular ulceration of the bowel and larynx; (4) pleurisy; (5) lardaceous degeneration of the liver, kidney, and other organs; (6) acute miliary tuberculosis: (7) thrombosis of veins; (8) chronic inflammation of the stomach and intestine; (9) fistula in ano.

126. TUMOURS.—*Lympho-sarcoma* sometimes involves the lungs by direct extension from the mediastinal or bronchial glands. The new formation follows the connective tissue of the lung, and penetrates the organ in a radiating manner from the root, burying the bronchial tubes and obstructing their lumina. *Secondary sarcomata* occur in the form of multiple tumours in the tissue of the lung.

Primary cancer of the lung is a rare disease. It usually takes its origin in the mucous glands of the bronchus, and produces a large tumour at the root of the lung. In structure it resembles a cylinder-celled epithelioma.

Parasites.—Of these the *echinococcus* is the most common. The cyst is usually found in the lower lobe of the lung, and may perforate into a bronchus or into the pleural cavity.

127. You can examine the chest by means of inspection, measurement, palpation, percussion and auscultation. You will find it best to make yourself thoroughly acquainted with the appearance, movements and sounds of the healthy chest before you begin to examine those affected with disease. It is from neglecting to do this that many students find the diagnosis of pulmonary diseases so difficult.

128. When examining a patient, let him stand or sit upright, whilst you *inspect* the chest, for this is sure to afford you valuable information. Observe if the sides are flattened and the sternum thrown forward (pigeon-breast), or if there is any flattening below either clavicle, for the latter is common in phthisis. See if the veins on either side of the chest or of the neck are much dilated, as this would lead you to suspect heart disease or an intra-thoracic tumour. It is well also to look if there is any enlargement of the glands of the neck or of the armpits, as in doubtful cases of phthisis or of cancer such a condition would greatly help your diagnosis. Always look where the apex of the heart beats, since this is apt to be displaced in different forms of chest disease (see 18). Next, watch how the patient breathes;

if one side expands less than the other you would suspect pleurisy or consolidation of the lungs, or if the subclavicular region appears to be comparatively motionless it would point to consolidation at that part of the lung.

129. The walls of the chest vary in size, shape, and mobility, in accordance with the condition of the organs they contain. You will therefore find it necessary to measure it in different diseases. The affected side is *expanded* in pleurisy with effusion and in pneumothorax; it is *contracted* when a lung, compressed by effusion, has become incapable of expansion after absorption of the fluid. In phthisis the upper ribs generally fall in, and their mobility is lessened, from the apices of the lungs being affected with tubercle. In measuring the chest, mark with ink the central points over the spinal vertebræ and sternum, and between these points stretch a graduated tape on each side, taking care that the patient holds his breath in a forced expiration. It is generally best to measure below the nipples in the male and below the breast in the female, while care must be taken that both sides of the tape are exactly on the same level. In the normal state the right side is a little larger than the left, and the chest increases on full inspiration about 1½ or 2 inches in circumference. Instruments have been invented to make the measurements more exact, but they are seldom required. The shape of any part of the chest can be ascertained by means of a *cyrtometer*. This consists of two bands made of pewter, graduated in inches, and joined together by a hinge. To use it, fix the hinge firmly over the spine and bend the band on each side round the chest, observing where the ends meet in the middle line in front. When you remove the instrument, place it on a book or table, and join the ends at the point at which they met when on the chest. By using the bands as a ruler, you can mark with a pen or pencil the shape of the chest, and thus record any difference that may exist between the sides of the thorax.

130. When you place the palm of your hand upon the

chest of the patient you will feel a vibration when he speaks. This is termed the *vocal fremitus;* it is a most valuable sign in the diagnosis of pneumonia, phthisis, and other diseases. The vocal fremitus is, however, feeble in females and in children, so that in these you are often deprived of the advantages to be derived from its use.

131. It is often of great importance to ascertain the rapidity of the breathing. An adult in health usually makes fifteen to eighteen respirations in the minute, but a child breathes much more quickly, and in various forms of disease the movements of the chest become greatly hurried. You may count the number of respirations either by watching the patient, or by placing the hand on the epigastrium.

132. When you strike upon a healthy chest, a clear sound is elicited, on account of the large amount of air contained in the lungs. But if the lung is emptied of air, by being compressed by fluid, as in pleurisy, or by its air-cells being filled with lymph, as in pneumonia, it is evident that the sound on percussion will be no longer clear, but dull. When, on the contrary, the pleura is filled with air, or the cells of the lung are distended, as in emphysema, it is equally plain that the chest will be more resonant than in the healthy condition. In phthisis the amount of dulness varies according as the air-cells are completely or only partially filled with tubercle.

133. You may employ percussion by means of a small hammer and a pleximeter made of ivory, or, as is better, by the fingers. In the latter mode you place the forefinger of the left hand quite flat upon the chest, and strike upon it with the tip of the middle finger, or the tips of the middle and forefingers held together, of the right hand. Always strike from the wrist, and not from the elbow; never use more force than is necessary to elicit a clear sound, and compare the corresponding parts of the opposite sides of the chest with each other. By thus using the fingers you can readily ascertain the amount of resistance offered by the parts you percuss, as well as the character of the sound elicited. You

should observe that, with the exception of the heart's space, the corresponding regions on each side of the chest sound equally clear. When the patient draws a full breath the percussion note is clearer, and in forcible expiration it is duller than in ordinary respiration. You must percuss more forcibly on and above the scapula than on the front of the chest.

In doubtful cases you may often ascertain the existence of slight dulness by percussing whilst the patient holds his breath after a full inspiration or a forced expiration, but under such circumstances you must be careful to compare exactly the same points on each side of the chest, and to strike with an equal degree of force.

134. In employing auscultation, if possible examine your patient when in a sitting position, and let him keep his mouth closed so as to breathe only through the nostrils. Where the respiratory murmur is feeble, it is often necessary to make him walk about to increase it by exertion. When you wish to examine the back of the chest, let the patient sit or stand, with the head bent a little forward and the arms flexed upon the chest, so as to separate the scapulæ as far as possible from the spine. Take care that such of the clothes as are not removed are loose, for the rustling of flannel may be readily mistaken for sounds produced by disease.

135. You may auscultate by placing the ear on the chest covered with a napkin, and this is often the best method of examining a child, as the appearance of the stethoscope may alarm it, but in the case of the adult it is better to employ the binaural stethoscope. Some students find a difficulty in the use of this instrument, but it is much superior to that made of wood, as it enables you to examine the patient in any position and with much less fatigue to yourself.

136. A sound named the "vesicular murmur" is produced by the air rushing into and distending the air-cells and bronchi during inspiration. If from any cause the lung, or a portion of it, acts more energetically than usual, the

murmur is increased; this is termed "*puerile respiration*," because in children the vesicular murmur is louder than in adults. If from any cause the activity of the lung is lessened, the sound becomes feeble. The most common causes of feeble respiration are obstruction of the air-cells by tubercle, a loss of the elasticity of the lungs, as in emphysema, or some obstruction to the free passage of the air through the larynx or bronchial tubes.

If you listen to the chest of a healthy person at any part excepting those that will be mentioned shortly, you will find that the sound of inspiration is soft and breezy; that of expiration is lower in tone, much less prolonged, and follows directly that of inspiration. This is termed the "*vesicular murmur*." Make yourself thoroughly familiar with the character of the sound, so that you will never fail to recognise it. In certain conditions the vesicular murmur, instead of being continuous, is interrupted at frequent, short intervals, and is then said to be "jerky" or "interrupted." This may be caused by the pressure of tubercles upon the finer bronchial passages, but it is often only the result of the nervousness of the patient inducing him to draw his breath in an irregular manner.

137. Next, place the stethoscope over the *windpipe* of a healthy person. You will find that there are two sounds accompanying the act of breathing, one produced by the air as it enters, the other as it leaves the chest. They are equal in length, and are both rough and harsh, and a distinct interval occurs between the cessation of the former and the commencement of the latter. They constitute what is termed "*tracheal* or *cavernous respiration*." Again, place the stethoscope at the upper part of the sternum, at the first costal cartilage close to the sternum, or between the shoulders near the fourth dorsal vertebra, opposite the point at which the trachea divides into the bronchi. Here the inspiratory sound is rather longer than that of expiration, both are softer and less hollow than over the trachea,

and they are separated by a slight but appreciable interval. This is "*bronchial respiration*," or "*tubular breathing*."

Cavernous respiration is most distinctly heard over an enlarged bronchial tube or cavity, but there is no distinct line of difference between it and well marked bronchial respiration. Consequently, you may have in a case of pneumonia what seems to you to be cavernous breathing, but which is, in reality, only the sound conducted from a large bronchial tube by a portion of consolidated lung. I mention this, as I have so often heard students diagnose a cavity in a case of recent pneumonia.

138. In a healthy chest the sound produced by the air rushing through the bronchial tubes is masked by the loudness of the vesicular murmur; but if the air-cells are extensively blocked up, as in pneumonia or phthisis, the bronchial sounds are plainly heard, forming "*bronchial* or *tubular respiration*." It will be evident that the character of the sound will vary with the size and shape of the passage which the air traverses, and consequently when a bronchial tube is much dilated, or ends in a cavity, we meet with "*cavernous respiration*."

139. The voice generated in a patient's larynx is imperfectly conducted by the healthy lung, so that when your ear is placed upon the chest only a buzzing sound is audible when you listen to the chest whilst he speaks. This sound, which is termed "*vocal resonance*," is most plainly distinguished when the patient uses the words "ninety-nine" or "nine hundred and ninety-nine," but it is always feeble and often inaudible in females and in children.

In a healthy person the voice is conveyed to the ear more distinctly in the interscapular region and at the junction of the first costal cartilages with the sternum than elsewhere, and here, as before mentioned, you can generally hear bronchial breathing. When the air-cells are filled with solid material, as in pneumonia and phthisis, the voice is also conducted to the ear more distinctly than normal and is heard more clearly. This is named "*increased vocal resonance* or *bronchophony*."

The voice is heard still more plainly and the words may be often recognised when the stethoscope is placed over a superficial cavity or an enlarged bronchial tube. In some cases even a faint *whisper* can be distinguished. This is known as "*pectoriloquy.*"

140. When air is drawn along the polished lining of a tube, a soft sound is produced; but if the internal surface is roughened or contracted, the nature of the sound is altered. In bronchitis, when the mucous membrane is greatly swollen, or films of hard mucus project here and there, so as to narrow the calibre of the tube, abnormal sounds, named "*rhonchi,*" result. The grave sounds

FIG. 31.

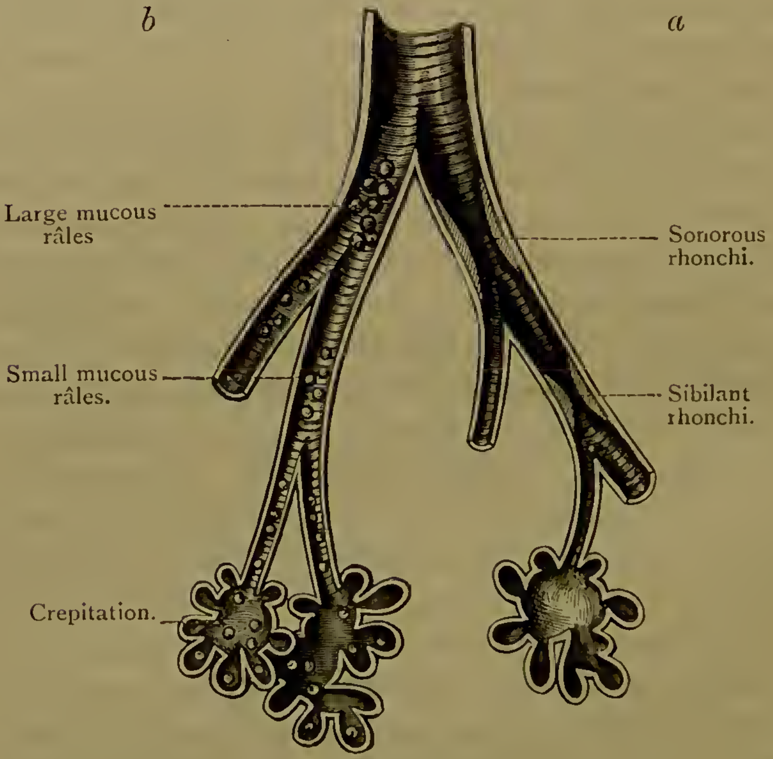
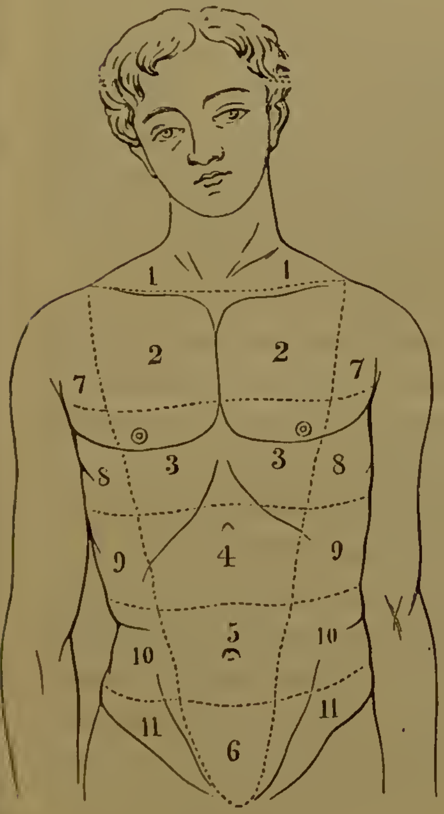


Diagram illustrative of râles in the bronchial tubes. The narrowing of a tube, as seen at *a*, gives rise to sonorous and sibilant rhonchi; fluid contained in a tube as at *b*, to moist sounds.
(DA COSTA.)

generated in the larger tubes are named "*sonorous rhonchi;*" those of a more piping or whistling character, arising in the smaller bronchi, are called "*sibilant rhonchi.*" (See fig. 31.)

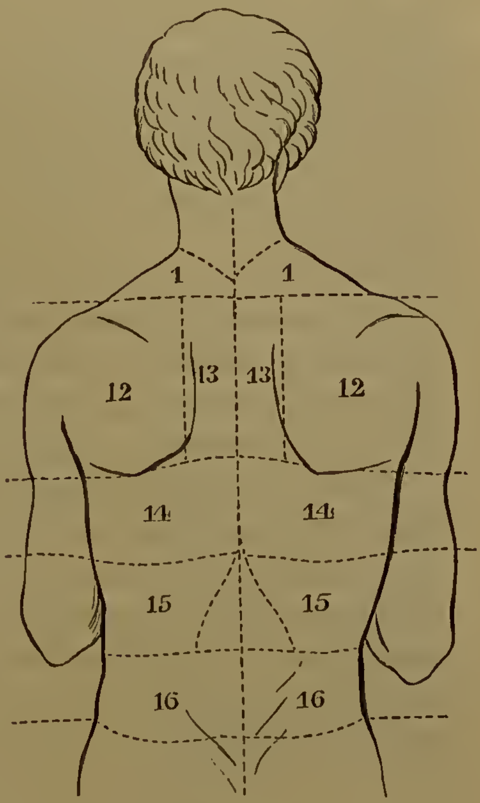
141. When the bronchial tubes are filled with liquid secretion, the air bubbles through it in passing to and from the lungs, and thus moist *sounds* are produced. These are termed large or small "*mucous râles,*" according to the size of the bubbles, and therefore of the air-passages in which they are generated. The term "*crepitation*" is applied to the fine sounds which are produced in the air-

FIG. 32.



1. Supra-clavicular. 2. Infra-clavicular. 3. Mammary. 7. Axillary. 8. Infra-axillary.

FIG. 33.



1. Supra-spinous. 12. Scapular or sub-spinous. 13. Inter-scapular (right and left). 14. Infra-scapular.

cells, as in cases of pneumonia, phthisis, and œdema of the lungs.

142. For the purposes of diagnosis the chest is supposed to be divided into regions with which you should make yourself acquainted. Figures 32 and 33 will enable you to understand the limits of these regions.

Whenever the symptoms point to some affection of the lungs do not be satisfied with a single examination in case you fail to discover evidence of disease. You may happen to overlook at a first visit some slight indication of serious mischief, which a more careful subsequent exploration may bring to light; or the extension of the malady may produce physical signs that were not perceptible when you first saw the patient.

The symptoms that should lead you to suspect the presence of disease in the lungs are—pains of the chest or side, cough, expectoration, spitting of blood (hæmoptysis), dyspnœa, sweatings at night, and loss of flesh.

Before examining a patient who is suspected to have a disease of the lungs, inquire if his complaint came on suddenly (*acute*), or if its development was slow and gradual (*chronic*), or if he is subject to *occasional* attacks, his health being good during the intervals. If the disease is acute begin at (143); if chronic, pass on to (169); if occasional, pass on to (189).

SECTION I

Acute Diseases of the Lungs

143. The acute diseases of the lungs are pneumonia, pleurisy, pneumothorax, bronchitis, whooping-cough, acute phthisis. In all these complaints direct your attention first to the lower and back parts of the chest below the scapulæ. Commence your examination with percussion. If there is

distinct dulness, begin at (144); if there is no dulness, pass on to (156); if you find abnormal clearness of sound, pass on to (186).

144. **A. You find distinct dulness on percussion.**—The disease is either pneumonia, pleurisy with effusion, or hydropneumothorax.

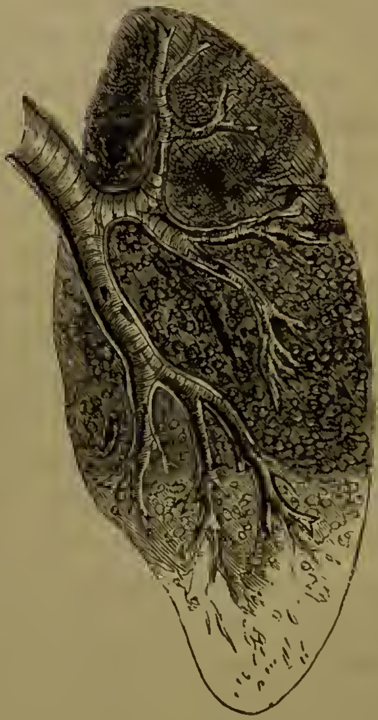
145. *a.* You hear tubular breathing alone, or accompanied by a fine crackling or bubbling sound during inspiration; there is increased resonance of the voice, and increased vocal fremitus; the heart is not displaced.

The disease is *acute lobar pneumonia.*

The crackling and bubbling sounds are termed "*crepitations.*" They either arise from bubbles of air passing through the fluid present in the air-cells and smaller bronchi, or by the separation of the walls of the air-cells glued together by exudation by the air entering the lung during inspiration. They are heard at the beginning of the disease, but towards the termination the crepitations are louder and more liquid than in the earlier period, and are known as "*redux crepitations.*" As soon as the lung becomes solid (red hepatisation), you have tubular breathing replacing the vesicular murmur. The increased resonance of the voice and the increased vocal fremitus arise from the solid lung conducting the sounds of the voice better than a healthy lung. The physical signs are generally first to be found at the base of the lung, and gradually mount upwards, but they may commence at either apex. Sometimes both lungs are implicated, but usually one is attacked before the other. In rare cases you meet with a tympanitic or cracked-pot note on percusssion over the front of the chest, when the posterior part of the lung is involved.

Pneumonia is ushered in by a severe shivering fit, followed by a rapid rise of temperature and pain of the side, which is not, however, of a sharp or cutting character, as in pleurisy, unless this disease be also present. There are from the first a marked feeling of illness, great prostration of strength, thirst, hot dry skin, white tongue, little or no appetite, confined bowels, and thick, scanty urine. The patient generally lies on his back, has a flush on one or both cheeks, an anxious expression of face, distended nostrils, a frequent, short cough, attended with *gluey*, *rusty-coloured*, *or bloody* *expectoration*, dyspnœa, very rapid breathing, quick and soft pulse, and often delirium at night. The average temperature in the axilla in pneumonia is 104°, but it may rise to 106° or even higher; average rapidity of the pulse, 120, accompanied by forty to sixty or even eighty respirations in the minute, during the height of the disease.

Fig. 34.



Physical Signs.	Stage of Disease.
Slight dulness on percussion; fine crepitation.	Engorgement and commencing hepatisation.
Dulness on percussion; tubular breathing; bronchophony; increased tactile and vocal fremitus.	Complete red hepatisation.
Dulness on percussion; tubular breathing; bronchophony; increased tactile fremitus; large moist-crepitations.	Grey hepatisation.

Illustrating the stages of acute pneumonia with their physical signs.

In favourable cases a crisis, or sudden subsidence of the fever, is apt to occur on the fourth, sixth, or seventh day of the attack, and is often accompanied by diarrhœa, severe sweatings, or the passage of a large quantity of thick urine (see fig. 35). The temperature may fall below the normal in twelve or eighteen hours accompanied by a corresponding diminution of the pulse and respirations and a general improvement in the condition of the patient. In cases that terminate unfavourably, the pulse becomes quick, feeble, irregular or intermittent, the rapidity of the breathing increases, the tongue is dry, the lips are covered with sordes, the face pale, the lips of a blueish colour, and the patient gradually sinks from heart failure.

FIG. 35.

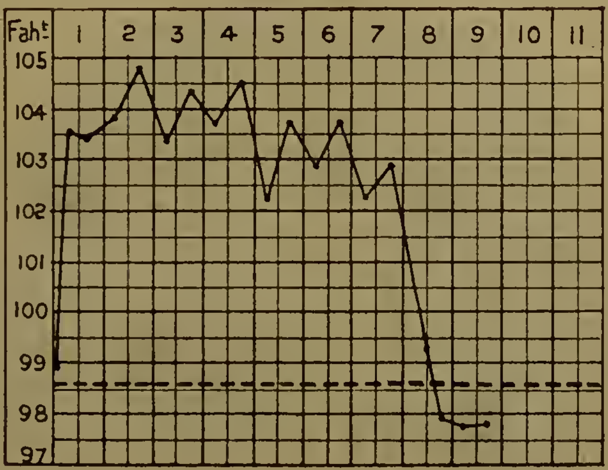


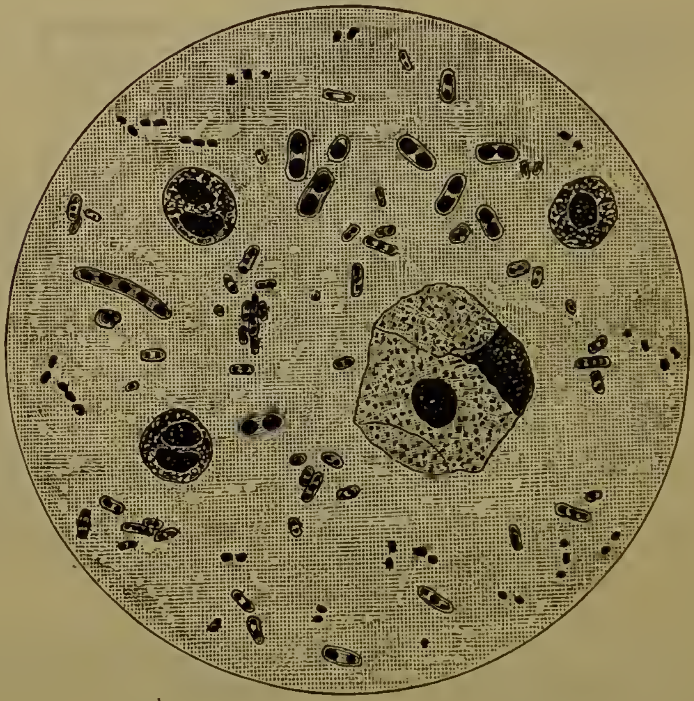
Chart of the temperature in a case of acute lobar pneumonia in which the crisis occurred on the seventh day.

During the height of pneumonia there is an absence or great diminution in the amount of chlorides in the urine; you ascertain this by adding a solution of nitrate of silver to the urine, previously acidified by nitric acid, and observing that only a slight precipitate is produced, or none at all. Albumen is often present in the urine, and if in large quantity it is an unfavourable sign. Jaundice occasionally presents itself, and there is usually an eruption of herpes on the lips.

Micro-organisms of different kinds have been discovered in the lungs of those who have died of pneumonia, and in the expectoration during life. The most important of these are the diplococcus of Fraenkel and the pneumococcus of Friedländer (see fig. 36). The diplococcus lanceolatus presents the shape of a short spindle partially divided into two portions each of which is of a lancet shape.

146. You will seldom meet with abscess of the lung as a result of pneumonia, but you may suspect that it has formed if severe shiverings occur in the later stage of the disease, and if, at the same time, the expectoration becomes purulent and contains lung-tissue, and the physical signs indicating a cavity in the lung are present.

FIG. 36.



Microbes in pneumonia. (V. JAKSCH.)

147. Gangrene is indicated by a very foul smell in the breath and expectoration, accompanied by sudden and marked prostration of the strength of the patient.

148. When the fever persists for some length of time, becoming increased at nights, and followed towards the morning by profuse perspirations, at the same time that the dulness on percussion remains; or if the disease has been ushered in with profuse spitting of blood, it is probable that the case will terminate in phthisis.

149. Œdema of the lung presents fine crepitations and bubbling sounds, attended by dyspnœa, cough, and profuse expectoration; but the expectoration is frothy and thin, sometimes blood-stained, and there is an absence of decided dulness on percussion and tubular breathing. Pulmonary œdema generally arises from diseases of the heart, kidneys, or liver.

150. You may have dulness on percussion and absence of respiration from *collapse of the air-cells*, as a sequence of capillary bronchitis or fever. It is chiefly met with in children and old people. You distinguish this condition from pneumonia by the history of the case, the lower elevation of the temperature, the absence of rusty-coloured expectoration, and the rapidity with which the affection commences.

In children collapse of the lung is very apt to occur on account of the smaller bronchi becoming blocked with mucus. Both lungs are generally affected, although one is usually more so than the other. It may escape recognition if only small and scattered areas of the lung are implicated, but when it occurs suddenly and a considerable extent of the lung has become collapsed, the distress of the child is increased, the respiration is very hurried, and signs of imperfect aeration of the blood present themselves. If the affected portions are small and scattered no physical signs can be recognised, but when a considerable area is collapsed, you will find impaired resonance on percussion, with feeble or tubular breathing.

151. *Catarrhal pneumonia* occurs chiefly in children and in old or feeble persons, but it is not infrequent in those who are affected with acute bronchitis, emphysema of the

lungs, or disease of the heart or kidney, or it may present itself as a sequela of measles, whooping-cough, influenza or other febrile conditions. It is seldom ushered in by rigors, but the temperature in most cases rises to 102° or 103° and it is accompanied by severe cough, rapid breathing, and increased quickness of the pulse. The expectoration is generally tenacious, but rarely presents a rusty colour. The complaint is usually of some weeks' duration, recovery is slow and gradual, and is very rarely attended with the sudden fall of temperature that characterises acute lobar pneumonia. Both lungs are usually affected together. In many cases the physical signs consist only of the dry and moist râles of bronchitis, but when a considerable patch of lung has been involved, you may find comparative dulness on percussion and tubular breathing. The physical signs should be sought for at the bases of the lungs.

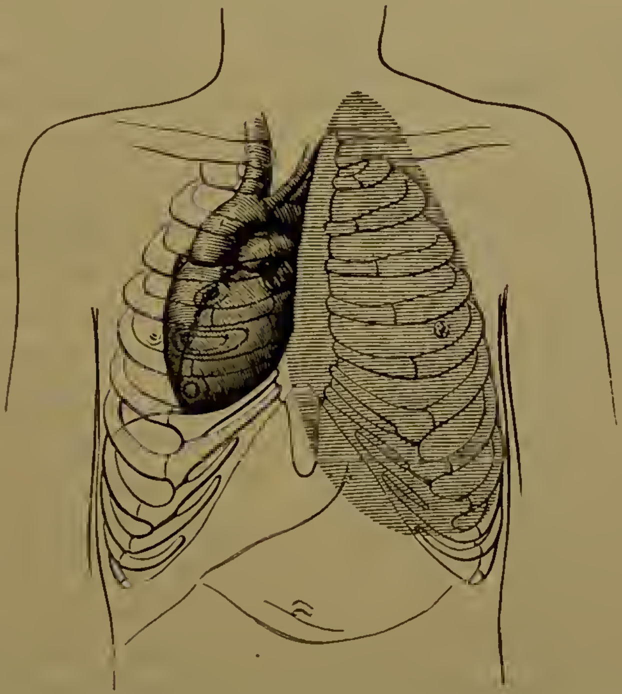
152. *b.* You find a diminution or absence of the respiratory murmur, vocal resonance, and of tactile vocal fremitus.

The disease is *pleurisy with effusion.*

The dulness and absence of respiration are caused by the lung being compressed by the fluid in the pleura. Consequently, the extent of the dulness will correspond with the amount of fluid. The respiratory sound is louder than normal on the opposite side of the chest. In some cases the whole side is dull. If the left side is affected the heart is displaced, and can be heard and felt to beat on the right of the sternum (see fig. 37), whilst the semilunar space occupied by the stomach at the lower part of the left hypochondrium, which ordinarily gives a clear sound, is dull on percussion ; when the right side is the seat of the effusion, the liver is pushed downwards, and may be often felt below the ribs. The affected moves less and measures more than the healthy side, and the spaces between the ribs are wider, flatter, or more bulging. In most cases tubular respiration can be heard in the interscapular region, and occasionally a peculiar bleating sound (ægophony) may be distinguished at the inferior angle of the scapula when the patient speaks.

Friction sounds may be generally heard at an early period. As the fluid is absorbed the physical signs diminish. Eventually the affected side may be found shrunken in size and distorted (see 3, fig. 38), the spine being curved towards the affected side, and in rare cases the heart may remain permanently displaced.

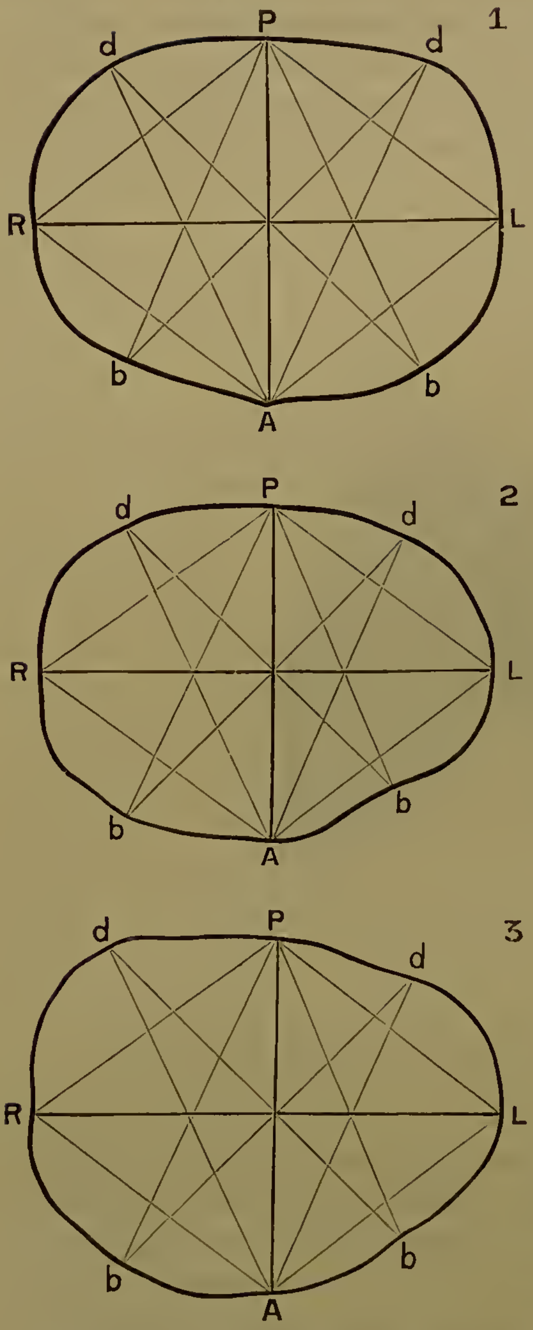
FIG. 37.



Position of the heart and large vessels when they are displaced by effusion into the left chest. (After SIBSON.)

The dulness on percussion is more absolute than in pneumonia, or, in fact, in any other chest disease, excepting some cases of cancer of the lung. When the fluid does not reach above the fourth rib it is not unusual to find above this part a tympanitic note on percussion (*Skodaic resonance*), and sometimes with a short, forcible stroke a cracked-pot sound can be elicited. The line of dulness is not on the same plane all round the side, so long as the pleura is not completely filled with fluid, but it is

FIG. 38.



Cyrtometric tracings from a case of pleurisy with effusion (left side). 1. Taken at the level of two inches below the nipple before tapping. 2. At same level after tapping. 3. At same level nine months laters. (WILSON FOX.)

higher behind than in front, and the line of dulness does not alter with the position of the patient. The diminution or absence of the vocal fremitus is, next to the displacement of the heart, the most important physical sign and it should be always carefully looked for. Measure the chest with the cyrtometer from time to time, and record any changes that may occur. Remember that normally the circumference of the right side is from one-quarter to one-half of an inch greater than the left. Fig. 38 will show how much information respecting the progress of pleurisy this procedure may afford. In some cases, and especially in children, tubular breathing may be heard over the whole of the affected side.

In this stage of pleurisy the patient rarely complains of pain or cough, and there is no expectoration unless bronchitis is also present, but the breathing is difficult and the respiration rapid. The pulse is quick, small, and feeble. In an uncomplicated case the temperature is usually elevated for two or three weeks after the commencement of the disease, and very gradually falls to, or below, the normal point. The patient is usually feeble and emaciated, there is an absence of appetite and severe sweatings are not uncommon.

153. If suppuration takes place (empyema), you will find the patient complain of shiverings and night sweats; the pulse becomes small and frequent, and there is rapid loss of flesh. In some instances there is œdema of the wall of the chest. The temperature is usually of a hectic type, rising to 103° or 104° F. in the evening, and falling in the morning to, or a little above, the normal, but occasionally there is little or no fever. Whenever you suspect the presence of pus, either from the long continuance of the physical signs or from the persistence of an elevated temperature, you should introduce the needle of a hypodermic syringe and withdraw a little of the fluid. It is well to employ a syringe having a stronger needle than that ordinarily used. Empyema is most apt to occur in children, after eruptive fevers, in persons suffering from phthisis and in drunkards. The matter may burst externally, or it may perforate the lung and give rise to sudden and profuse expectoration of pus.

154. The liver when enlarged may project upwards as far as the fourth rib, or it may be pushed upwards by an accumulation of gas in the intestines or of fluid in the abdomen, and thus simulate a partial effusion into the right side of the chest. You will find, however, that the line of dulness in such a case is higher in front than behind, that it descends on full inspiration and rises on full expiration, which is not the case in pleuritic effusion.

155. You distinguish pleurisy with effusion from pneumonia by the history of severe pain in the side, by the absence of rigors in the former complaint, and by the very rapid respiration, severe cough, the tough, blood-

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF ACUTE CHEST DISEASES ATTENDED BY DULNESS ON PERCUSSION.

	LOBAR PNEUMONIA.	CATARRHAL PNEUMONIA.	PLEURISY WITH EFFUSION.
Commencement	Rigors followed by fever	Bronchitis	Chills ; no rigor
Pain	Usually present	Rarely any pain	Severe pain at first
Cough	Severe	Severe	Slight or absent
Expectoration	Viscid, blood-stained	Mucus ; no blood	None
Respirations	Very rapid	Rapid	Short and hurried
Temperature	Sudden rise ; falls by crisis 5th to 8th day	Sudden rise ; remittent	Moderate rise ; slightly remittent
Measurement of Chest	Not increased	Not increased	Larger on affected side
Tactile fremitus	Increased	Not necessarily increased	Absent or greatly diminished
Displacement of heart	None	None	Heart displaced
Dulness on percussion	Marked dulness	Not well marked ; often absent	Complete both front and back
Vocal resonance	Increased	Often normal ; may be increased	Absent or diminished
Breath sounds	Tubular and crepitations	Rhonchi, tubular breathing, crepitations	Diminished or absent
Course of disease	Usually terminates 5 to 9 days	May be prolonged for weeks	Progress generally slow

coloured expectoration and higher temperature of the latter. In pleurisy the chief physical signs are—Enlargement of the affected side, dilatation of the intercostal spaces, displacement of the heart, dulness of the semilunar space occupied by the stomach if the left side, and depression of the liver when the right side is affected, diminution or absence of vocal fremitus and respiratory sounds; in pneumonia they are—crepitations, increased vocal fremitus and bronchial respiration without enlargement of the chest or displacement of the heart.

156. **B. There is no dulness on percussion.**—It is either pleurisy without effusion of fluid, bronchitis, whooping-cough, or acute miliary tuberculosis.

157. *a.* The breath and voice sounds are normal, but you hear a superficial rubbing or grating sound accompanying the respiration.

The disease is *pleurisy without effusion of fluid.*

The creaking is occasioned by the rubbing together of the roughened surfaces of the pleura (see fig. 39). Usually it accompanies both inspiration and expiration, but sometimes it can be only heard on full inspiration. It may be mistaken for the sonorous rhonchus of bronchitis, and if there is any doubt on this subject, direct the patient to cough; this generally alters the sound in bronchitis, but leaves that of pleurisy unaffected. On account of the pain, the movements of the chest are quick and constrained and the sounds of respiration are feeble.

The complaint is generally ushered in by chilliness. The patient complains of sharp pain, usually near the nipple, increased by movement, especially by inspiration, coughing or sneezing. The breathing is short and hurried; there is often a short cough unattended by expectoration; if present, the expectoration is never of a rusty colour, and the patient lies on the back or on the affected side. The pulse is quick, usually in proportion to the amount of fever, the temperature is raised, but is rarely above 102° or 103° F. In most cases effusion of fluid takes place, when the pain lessens or disappears, the cough ceases, but the breathing becomes more difficult. When the inflammation commences at the diaphragm, the pain is often very severe and radiates upwards to the shoulders or downwards to the abdomen, the temperature is much raised, but no physical signs may be detected until some days after the onset of the illness.

FIG. 39.

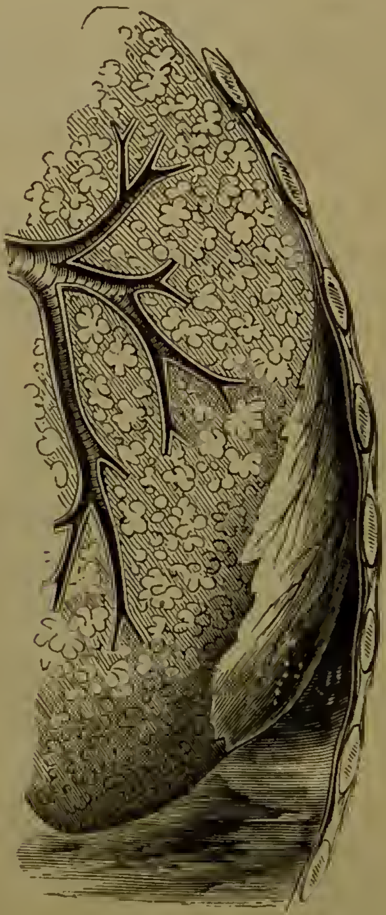

Friction sound.
Great dulness; respiration absent; vocal resonance absent; vocal fremitus absent.

Diagram showing roughening of the pleura at the middle, and effusion of fluid at the lower, part of the chest. (DOBELL.)

Pleurisy sometimes occurs as a chronic disease, but the physical signs are the same as in the acute form.

158. You must remember that the sharp pain of pleurisy may be simulated by rheumatism of the muscles (pleurodynia) and neuralgia, and that severe pain in the side may be the precursor of an attack of herpes (shingles). In none of these are there fever, friction sounds on inspiration, or dulness on percussion.

159. *b.* The vesicular murmur is replaced by sonorous and sibilant rhonchi, or moist râles, but there is no alteration either in the vocal resonance or vocal fremitus.

The disease is *acute bronchitis.*

Accustom yourself to distinguish the dry from the moist sounds of bronchitis. Crepitations may be simulated by the rubbing of the stethoscope on the hair of the chest, by rustling of the dress, and by air in the subcutaneous tissue (emphysema). The crackling produced by the pressure of the stethoscope upon hair can be lessened or removed by wetting the part with water.

When the larger tubes are alone affected the patient first complains of chilliness followed by more or less fever (the temperature rarely, however, exceeding 101°), dull, oppressive pain, or tightness of the chest, often referred to the sternum, cough, often severe and coming on in paroxysms, and expectoration. The expectoration is at first glairy or frothy, semi-transparent mucus; afterwards opaque or puriform. It is never rusty-coloured, as in pneumonia, although it may be streaked with blood. The complaint usually terminates favourably.

160. Bronchitis of the smaller tubes (*capillary bronchitis*), which is often preceded by the former, attacks young children, those who are advanced in life, or who suffer from emphysema or other chronic disease, or who have been affected by influenza, measles, or other infectious fevers. The temperature is at first elevated (102° or 103°) but it soon falls, the cough is constant, expectoration difficult or it may be absent, the breathing rapid (50 or 60 in the minute), the pulse quick and feeble. In unfavourable cases the face becomes pale and the lips bluish, the patient is drowsy, and

delirium comes on. There are rhonchi and crepitations in all parts of the chest, but the mucous râles are small and chiefly confined to the bases of the lungs. Some patients recover slowly, but this form of bronchitis is attended with great danger to life. When you observe that the epigastrium sinks in, and that the lower ribs are drawn inwards during inspiration, you know that the entrance of the air into the pulmonary vesicles is seriously obstructed. Capillary bronchitis is apt to give rise to *collapse* of portions of the lung and lobular pneumonia (see 150, 151.)

161. *c.* The patient is frequently attacked with short fits of violent, rapidly interrupted coughing, alternating with long drawn, shrill, crowing inspirations; the seizures usually ending with the expectoration of a thick, glairy mucus, or vomiting. During the fits the features become red or congested, the eyes prominent, and the child seems on the verge of suffocation.

The disease is *whooping-cough.*

This complaint is most common in childhood; it occurs as an epidemic, is very infectious, and usually affects a person only once in his lifetime. It often follows measles or scarlatina. The whoop is produced by spasmodic closure of the glottis. The disease is preceded for many days by fever, discharge from the nose and eyes, cough and expectoration, and the other symptoms of a "cold." This is succeeded by a decline of the fever, and the appearance of the characteristic cough (convulsive stage). If there is no complication the child continues in tolerable health between the attacks of cough, the appetite is good, and the nutrition unaffected. In some cases there is bleeding from the nose and gums produced by the violence of the cough. Ulceration is often observed at the frænum of the tongue, probably caused by the teeth. After some time the violence and frequency of the attacks decline, and the expectoration becomes less viscid and smaller in quantity (stage of decline). The disease is often attended with bronchitis and lobular pneumonia, and, as the smaller tubes are frequently affected, in fatal cases the air-cells are generally found to be collapsed in different parts of the lungs. In some cases the patient afterwards suffers from emphysema or tuberculosis; occasionally death occurs from convulsions.

162. *d.* If along with the physical and general signs of bronchitis the patient has severe fever, an unusual difficulty of breathing, a brown tongue, rapid loss of flesh and strength, and profuse night sweats, you may suspect *acute miliary tuberculosis.*

Acute miliary tuberculosis generally commences with languor and feebleness. The temperature is high, but there is a considerable difference between that of the morning and evening. The pulse is quick and feeble and emaciation soon attracts attention. The symptoms vary according to the organ chiefly implicated: in some peritonitis takes place, and there is then great difficulty in distinguishing it from typhoid fever. The lungs are always affected, and the physical signs may throughout the illness be only those of bronchitis, but the amount of fever and the dyspnœa are in excess of what might be expected from the examination of the chest. The diagnosis must be determined mainly by the history of a family predisposition to phthisis, or by the patient having recently suffered from measles or whooping-cough, or from his being affected with a tubercular affection of the lungs, joints, or other part. Any indication of meningitis will greatly assist the diagnosis, as will also the discovery of tubercles in the choroid by the ophthalmoscope, or of tubercle bacilli in the expectoration. The disease usually runs its course in from three to ten weeks. If you cannot discover physical signs of consolidation of the lungs, tubercles in the choroid, or symptoms of meningitis, you are scarcely justified in giving a positive diagnosis of acute miliary tuberculosis.

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF ACUTE CHEST DISEASES WITHOUT DULNESS ON PERCUSSION.

	PLEURISY WITHOUT EFFUSION.	BRONCHITIS.	WHOOPING COUGH.	ACUTE MILIARY TUBERCULOSIS.
Commencement	Sudden	Sudden	Comes on slowly	Usually sudden
Pain	Severe	Sense of oppression	None	None
Cough	Short and dry	Severe	Severe in paroxysms	Usually severe
Expectoration	None	Mucus	Mucus	Mucus, may be hæmoptysis
Temperature	Moderately high	Moderately high	Normal	Usually high
Friction sound	Well marked	None	None	None
Sonorous and sibilant rhonchi	None	Usually present	Occasionally present	May be present
Mucous râles	None	Numerous	None, unless bronchitis present	Numerous

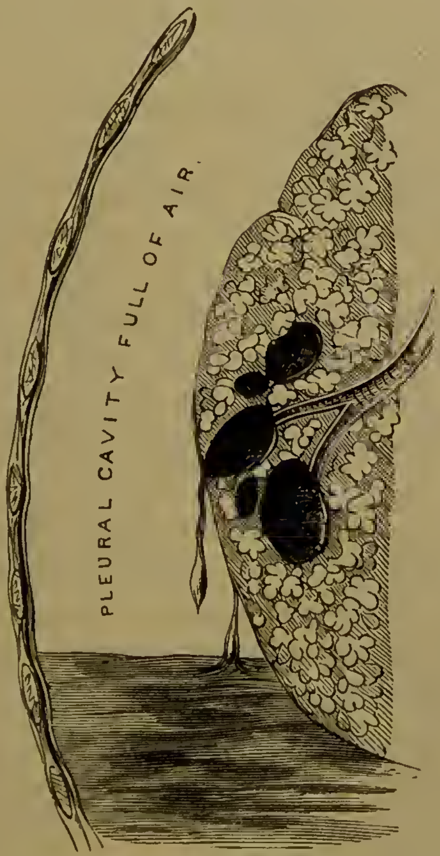
163. **C. Percussion elicits a clear note, like that of a drum over one side of the chest (tympanitic sound).**—You can have only one acute disease of the chest—viz., *pneumothorax.*

164. *a.* The respiratory sounds, vocal resonance, and fremitus are greatly diminished or are absent, there is distension of the affected side, bulging of the intercostal spaces, immobility or diminished movements of the ribs, and displacement of the heart.

The disease is *pneumothorax.*

The air in the pleura compresses the lung, and thus prevents respiration in the same way as the fluid of pleurisy does. Inflammation is usually set up in the pleura, so that afterwards you find dulness on percussion from fluid at the base of the chest, and hyperresonance above. The limits of the dulness usually vary with the position of the patient, being much higher in front when he is sitting upright than when he lies upon his back.

FIG. 40.



Percussion tympanitic; respiration absent; vocal resonance absent; vocal fremitus absent.

Heart displaced.

If fluid accumulates.

Splash on being shaken; dulness on percussion, which shifts with position of body; metallic tinkling.

Diagram of the physical signs in pneumothorax with fluid below.

When a coin is placed on the chest and percussed with another similar coin a loud metallic sound can be heard through the stethoscope. Sometimes you can find a loud echo with the voice ("amphoric voice"). If fluid is present in the chest a tinkling sound can be heard with the stethoscope, and a splashing when the patient moves or is shaken.

In the majority of instances the air is admitted into the pleura by the bursting of a small cavity; consequently the signs of pneumothorax are usually preceded by the symptoms of phthisis. It may, however, result from the bursting of an empyema through the lung, or from an injury to the ribs or chest. When the rupture occurs, as it generally does, during a fit of coughing, the patient is seized suddenly with severe pain in the side, intense dyspnœa and great faintness, the pulse being weak and fluttering and the temperature depressed. If he recovers from the collapse the temperature rises above the normal, the pulse is rapid and feeble; he sits upright or lies wholly on the affected side; there are blueness of the face and lips, profuse sweating, and more or less swelling of the face and limbs.

In some instances the air is admitted into the chest slowly and through a minute opening, so that the symptoms come on very gradually, and the difficulty of breathing is the most marked feature of the case. The accident usually ends fatally.

165. The percussion note is abnormally clear only in pneumothorax, emphysema, over a large superficial cavity of the lung, and over a subphrenic abscess when this contains gas.

166. Emphysema is a *chronic* disease in which both sides of the chest are affected, the intercostal spaces are normal, and the respiration audible though feeble; pneumothorax is an *acute* complaint, in which only one side is affected, the intercostal spaces are dilated, the respiratory murmur is absent, and the heart is displaced.

167. With a very large, superficial cavity in the lung you may meet with a clear percussion note and a metallic sound on inspiration, but it differs from pneumothorax in its being confined to the upper portion of the chest, in the walls of the chest being depressed instead of distended, and in the absence of a history of a sudden attack of pain and great difficulty of breathing.

168. The most difficult diagnosis is between pyo-pneumo-

thorax and subphrenic abscess. You can distinguish it, however, from the latter affection by the presence of a normal percussion note and inspiratory murmur over the upper part of the chest, by the extension of these downward on a full inspiration, by the variations in the area of dulness produced by changes in the position of the patient, by the history of the symptoms of gastric ulcer, and by the absence of symptoms pointing to disease of the lungs.

SECTION II

Chronic Diseases of the Lungs

169. The chronic diseases of the lungs are — chronic pleurisy, hydrothorax, phthisis, cancer of the lung, chronic bronchitis, and emphysema.

Commence your examination with percussion. If you find dulness on percussion, begin at (170); if you find no dulness, pass on to (183); if the percussion is abnormally clear, pass on to (186).

170. **A. You find dulness on percussion.**

171. *a.* The dulness is chiefly or entirely confined to the lower and back parts of the chest, and is associated with absence of respiration, of voice sound, and of vocal fremitus.

The disease is either *chronic pleurisy with effusion* or *hydrothorax.*

As there is effusion of fluid into the pleura in hydrothorax, the physical signs are similar to those of pleurisy with effusion. To distinguish between these, remember that pleurisy generally affects only one, but hydrothorax both sides of the chest; that the invasion of pleurisy is sudden, attended by pain, and in the first stage it presents a friction sound; whilst hydrothorax occurs only as a part of general dropsy, or as a consequence of disease of the heart, kidneys, or liver; also that in hydrothorax you do not find the intercostal spaces obliterated or the heart displaced as in pleurisy.

172. If you find no dulness at the lower part of the chest, percuss very carefully the clavicles, the sub-clavicular and supra-spinous regions. Compare the resonance of the corresponding parts on each side, and if you have any doubt as to the existence of dulness, percuss during full inspiration and forced expiration. Observe also whether both infra-clavicular spaces expand equally during inspiration; this can be done by placing the hand on the part, or by measuring with a tape or callipers. Compare the relative lengths and the tones of the inspiratory and expiratory murmurs in the infra-clavicular, supra-clavicular, and supra-spinous regions on either side. This you can do, either by placing the ordinary stethoscope alternately on the same place on each side, or by listening to both sides at the same time with the differential stethoscope. Remark if the inspiratory sound, instead of being continuous, proceeds in a "jerking" manner, or if it be in any place "tubular;" or if after a full inspiration a slight "click" occurs at the end of it. Compare also the resonance of the voice on each side. You will generally find it useful to direct the patient to cough, and directly afterwards to draw a full breath.

173. *b.* The dulness is in the upper regions of the chest, and is attended either with feeble inspiration, increased expiration, harsh inspiration, jerking inspiration, tubular respiration, dry clicking, increased vocal resonance, and with lessened mobility or diminished fulness below the clavicles.

The disease is probably *consolidation of the lung by tubercle.*

You must not diagnose phthisis merely because you discover one or more of the above signs, but should always take into account the general condition of the patient. On the other hand, you must not conclude that tubercular consolidation is absent because you do not at once detect the physical signs of this condition. If the general symptoms are indicative of phthisis you must examine the chest from time to time before giving a decided diagnosis.

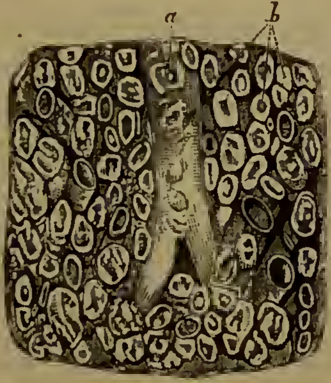
Tubercular disease of the lungs may present itself as an acute or chronic affection. Cases that run their course within two or three months are generally said to be acute, those beyond that time are looked upon as chronic. You must remember, however, that a case that begins as an acute affection may subside and become chronic, or, on the other hand, a long-standing case may suddenly develop high fever and other signs of rapid phthisis. Chronic phthisis may last for many months or even for years.

FIG. 41.

PHYSICAL SIGNS.

STAGE OF DISEASE.

Slight percussion dulness; feeble inspiration; increased expiration; increased vocal resonance.



Tubercle in the first stage (deposition).

a. Bronchial tubes. *b.* Tubercles filling up the air-cells of the lungs.

174. Acute miliary tuberculosis has been already described (162). Acute phthisis occasionally follows lobar pneumonia. Sometimes the symptoms and physical signs of acute bronchitis accompany, and mask, the tubercular affection. In all these cases you must carefully examine the chest from time to time, so as to detect the first indications of consolidation of the lung. In the absence of these you will frequently find it necessary to determine your diagnosis, by the history of a hereditary predisposition, the persistence of the symptoms, the elevation of temperature, and

the evidence afforded by the microscopic examination of the sputa.

175. In chronic cases the symptoms of the first stage of tubercle in the lungs (deposition) usually come on very gradually. They are cough, chiefly in the mornings, expectoration, generally small in amount, of ropy or glairy mucus, hæmoptysis, shortness of breath on exertion, general languor, pains in the side or below the clavicles, loss of flesh, night sweats, and a pulse increased in frequency.

Some are ushered in without any previous symptoms by an attack of hæmoptysis, which may subside and leave the patient for a time apparently in his usual health, or it may be followed by cough, increased temperature, quickness of pulse and the other symptoms of phthisis. In other instances the cough is preceded for a length of time by loss of appetite, pain after food, constipation and signs of dyspepsia, attended with loss of flesh and strength. In doubtful cases examine the gums and see if there is a red line round the teeth, also the nails if they are curved downwards at their sides and ends (filbert nails), for both of these signs are apt to accompany phthisis. Hæmoptysis is the most suspicious symptom; if the patient is free from heart disease, and if, in the case of a female, she is not suffering from disordered menstruation, the occurrence of hæmoptysis almost always indicates the presence, or the future occurrence, of tubercle in the lungs. Inquire if any other members of the patient's family have suffered from phthisis, and in all cases of doubt examine the expectoration for lung-tissue and tubercle bacilli. Ascertain also the temperature, for if it be persistently high, and no other disease likely to account for the fever be present, there is a great probability of tubercle.

176. *c.* The dulness on percussion is over the upper part of one or both lungs, and is accompanied by crepitation, tubular breathing, increased vocal resonance and increased tactile fremitus.

The *tubercle is in the stage of consolidation.*

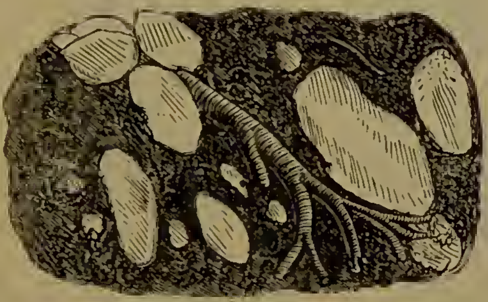
The crepitation arises from the air passing through the tubes and minute cavities filled with fluid. The dulness and increased vocal resonance show that the disease is not simply bronchitis. In case you have only doubtful dulness, and find crepitation confined to the upper parts of the lungs, examine the sputa for lung-tissue and tubercle bacilli. In this stage you can generally detect a certain amount of flattening below the clavicle, and deficient movement of this part of the chest (fig. 42).

177. *d.* The dulness on percussion is over the upper part of one or both lungs, and is accompanied by a tracheal form of breathing (cavernous respiration) and voice (pectoriloquy), or by a splash when the patient coughs.

FIG. 42.

PHYSICAL SIGNS.

Deficient mobility and flattening of chest ; percussion dulness ; tubular breathing ; crepitations ; increased vocal resonance.



STAGE OF DISEASE.

Tubercle in second stage (consolidation).

Tubercle in the lung in the second stage (consolidation).

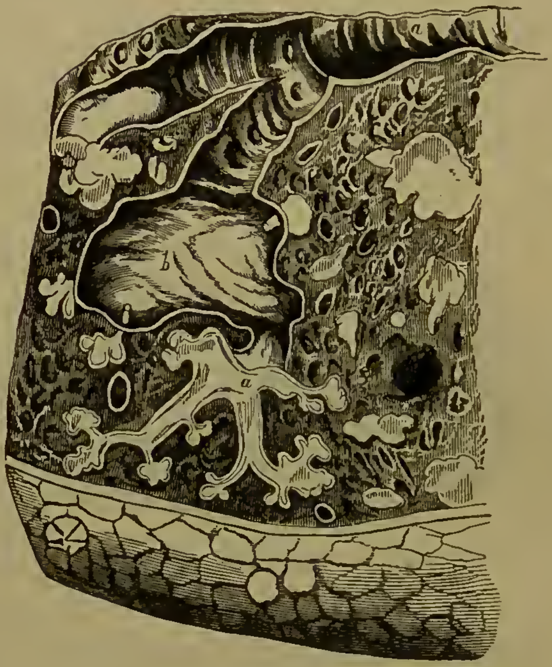
There is *a tubercular cavity of the lung.*

The cavernous respiration and pectoriloquy show that the cavity is at least partially empty ; when there is a splash (gurgle) on coughing, the cavity contains both air and fluid.

When a large empty cavity exists near the surface of the lung, you often have a very clear sound on percussion, and cavernous respiration. Remember that pectoriloquy is best heard when the patient whispers (fig. 43). The " cracked pot " sound on percussion occurs not only over superficial cavities, but occasionally in pneumonia, in pleurisy with effusion, and even in healthy children, the walls of whose chests are unusually yielding.

In very chronic cases, where there is a contracting cavity in the left side, the lung may be retracted and the heart left uncovered. Under these circumstances, you will find on percussion, that the cardiac area is enlarged, the heart itself sometimes elevated, and the impulse to be felt and heard at the third or fourth left costal cartilage (see fig. 15). The heart may, in like manner, be drawn to the right side, when there is an extensive cavity in the right lung.

FIG. 43.



Cavity when partially full.

Percussion dulness; cavernous respiration; gurgling; pectoriloquy.

Cavity when empty of fluid.

Not necessarily percussion dulness; cavernous respiration; pectoriloquy.

Cavity of the lung opening into a large bronchial tube.
a. Bronchial tube. *b.* Cavity.

As phthisis progresses, the cough becomes more frequent, the expectoration more copious and purulent, or it may contain airless masses, which from their resemblance to coins have been named "nummular." The emaciation becomes more rapid, the night sweats more regular and profuse. There are frequent attacks of pain in the chest or sides from pleurisy, the pulse rises in frequency, the voice is often indistinct and whispering, the tongue is covered with aphthæ, vomiting distresses the patient, especially in the morning, and swelling of the feet, and severe attacks of diarrhœa occur.

178. Ulceration of the larynx may usher in tubercular disease of the lungs, but more generally it presents itself in the later stages, and adds greatly to the distress of the patient, by the increased cough and the pain and difficulty in swallowing it induces. In like manner, chronic diarrhœa, resulting from ulceration of the intestines, may precede the ordinary indications of consumption, but usually it shows itself as a prominent symptom when the disease has persisted for some length of time. In some instances, lardaceous degeneration of the liver, spleen or kidneys, with their accompanying symptoms, develop in the later stages.

179. The physical signs of the stage of excavation are the same as when a cavity has been produced by pneumonia, which is, however, rare. In such a case the cavity is usually at the base of the lung, and you have the history of pneumonia to guide you (145).

180. You may have the physical signs of a cavity in cases of dilated bronchus (fig. 25); but the general symptoms are of less severity than in phthisis, the signs indicating the existence of a dilatation are usually confined to the base of the lung or mammary region, the fits of coughing although violent, are apt to recur only at long intervals, the expectoration has often a very fœtid smell and contains putrid cheesy plugs, while no lung-tissue or tubercle bacilli can be discovered in it by the microscope.

181. Chronic phthisis is closely simulated by *chronic inflammation* of the lung of a non-tubercular character (*chronic interstitial pneumonia*). This is always a chronic malady, but occasionally it commences in a subacute form. It is accompanied by cough, expectoration, dyspnœa and the other signs of phthisis, but there is rarely much elevation of temperature or quickness of the pulse.

In chronic interstitial pneumonia the increase in the severity of the symptoms is very slow, or they may for a time subside and leave the patient weak and emaciated, but in other respects in tolerable health.

Only one lung is ordinarily attacked, or if both are implicated, one is much more so than the other. The affected side is diminished in size, the walls of the chest are often retracted, the motions of the ribs much diminished; there are dulness on percussion, tubular breathing and increased vocal resonance, and if a cavity exists, the physical signs denoting it may be discovered. The patient is liable to dangerous attacks of capillary bronchitis accompanied by the physical signs of that disorder. Dilatation of the heart often comes on towards the close of the case, or lardaceous degeneration of the liver, spleen or kidneys may cut short the life of the patient.

182. Cancer of the lung may present the general symptoms of phthisis with dulness on percussion and tubular respiration. It is, however, usually attended with more persistent hæmoptysis, and no lung-tissue or tubercle-bacilli can be found in the sputa. The duration of the complaint is shorter, the weakness of the patient progresses far more rapidly than in phthisis, and the dyspnœa is often excessive. The dulness on percussion is more absolute than in tubercular disease, the physical signs increase more quickly, and enlarged glands can be often found in the neck or axillæ.

183. **B. You can discover no dulness on percussion.**

184. *a.* The percussion note is normal, and you find the respiration accompanied by rhonchi or râles.

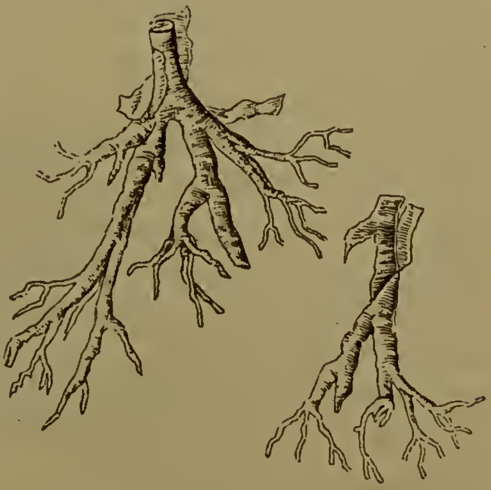
The disease is *chronic bronchitis.*

Chronic bronchitis differs from the acute form of the disease in its slower progress, and in its symptoms being less severe. It may follow an attack of acute bronchitis, or it may come on gradually. It is very apt to recur, at first every autumn, disappearing in the summer months, but the attacks become more frequent, until the symptoms persist through the whole year.

In the earlier stages the cough and expectoration are the only subjects of complaint; there is an absence of hæmoptysis and fever, and the patient may enjoy good general health. Exacerbations are, however, apt to occur after exposure to cold, wet, or sudden changes of weather. In one form the expectoration is very scanty (*dry bronchitis*); in rarer cases and where the disease is of longer duration, large quantities of a thin, watery fluid are brought up, and the patient becomes exhausted by the continual cough, and the excessive expectoration (*bronchorrhœa*).

Occasionally in cases of chronic bronchitis the expectoration exhales such a very fœtid odour that you may suspect gangrene of the lung. You distinguish it from gangrene by the absence of a history of pneumonia or phthisis, and by your being unable to discover particles of gangrenous lung-tissue in the expectoration.

FIG. 44.



Casts of the bronchial tubes expectorated in a case of plastic bronchitis.

Sometimes tree-like casts of the ramifications of the bronchi are expectorated. Such cases are usually very chronic, and are often attended with severe attacks of hæmoptysis. This form of the disease is termed *plastic bronchitis* (see fig. 44). In most cases the expectoration eventually becomes muco-purulent and profuse, the patient loses flesh and strength, and emphysema of the lungs or dilatation of the heart, with their attendant symptoms, become developed.

When the dry or moist sounds are confined to the apices of the lungs, even if there be no dulness on percussion, you ought to suspect the presence of tubercle, and should examine the sputa for lung-tissue and tubercle bacilli. All the *general symptoms* of phthisis may be present in chronic bronchitis (night sweats, emaciation, &c.), excepting profuse hæmoptysis ; the difference in the physical signs, and the absence of lung-tissue and tubercle bacilli in the expectoration, will serve to distinguish these diseases.

185. Dilatation of the bronchial tubes (*bronchiectasis*) may be either of a cylindrical or saccular form. It occurs along with chronic bronchitis, fibroid pneumonia, and emphysema, or may follow whooping-cough in young persons. The cough in well-marked cases may be quiescent for hours at a time, and then commence suddenly, and terminate with the rejection of a considerable quantity of expectoration. The expectoration is generally thick and muco-purulent, and in some cases exhales a fœtid odour. The dilatations are most common at the bases of the lungs, and the physical signs vary with their position and form. In some you will only find comparative dulness on percussion attended by increased resonance of voice and large râles. Where the dilatations are saccular and not far from the surface of the lung the physical signs are those of a cavity. You can only diagnose them from a cavity by the absence of a rapid loss of flesh and of fever, by the persistence and want of increase of the physical signs at the same place, by the improvement of the patient under treatment, and by the absence of lung tissue and of tubercle bacilli from the sputa.

186. **C. The percussion note is abnormally clear.**

187. *a.* The percussion note is abnormally clear on both sides of the chest, the respiratory sounds are feeble and indistinct, or they may be attended with the sounds of bronchitis, or there is a prolonged and hoarse sound on expiration ; the resonance of the voice is lessened, the shape of the chest

is spherical or barrel-shaped, and the ribs move but slightly.

The disease is *emphysema*.

The heart's space is clear on percussion, and its sounds are feeble or inaudible in the ordinary place, but may be loud at the lower part of the sternum. Posteriorly a clear sound is elicited, even to the lowest ribs, the upper part of the hepatic region is also clear on percussion, and the liver may be often felt below the ribs on the right side, whilst the heart is pushed downwards, so that, though its impulse cannot be detected in its usual place, it can be seen or felt to pulsate in the epigastrium (see fig. 45). These changes result from the over-distension of the lungs. As bronchitis is usually also present, the auscultatory signs of this affection are often associated with emphysema, and are most distinct at the bases of the lungs.

FIG. 45.

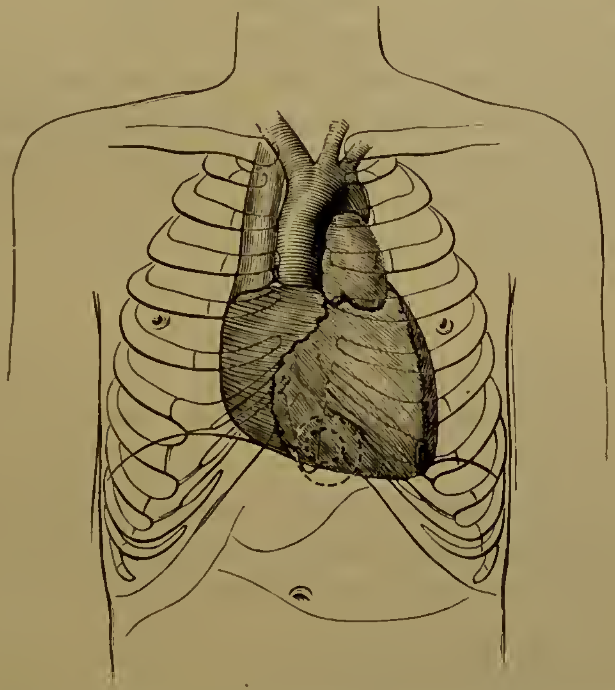


Diagram of displacement of the heart downwards in emphysema of the lungs. The right side of the heart is dilated. (After SIBSON.)

The chief symptoms of emphysema are dyspnœa, increased on exertion, and especially felt after a full meal, attacks of asthma and bronchitis, cough and expectoration. In the later stages, dilatation of the heart often takes place, and blueness of the lips, pulsation of the jugular veins, dropsy, and other symptoms of that disease show themselves.

188. There is a form of emphysema (*atrophous emphysema*) in which, although the air-cells are dilated, the lungs are diminished in size. It occurs in old persons and the prominent symptom is dyspnœa, increased by exertion. Although the sound on percussion is abnormally clear, the heart's space is dull, and increased resonance cannot be detected at the bases of the lungs. The inspiratory murmur is feeble, the expiratory sound is prolonged. The heart and liver are not displaced.

SECTION III

The Attacks of the Disease are only Occasional

Attacks of bronchitis may be occasional, but asthma is the only disease usually included under this head.

189. *a.* During the attacks the percussion note is clear, the respiratory murmur is very feeble, or mixed with sonorous and sibilant rhonchi.

The disease is *asthma.*

Asthma is produced by the spasmodic contraction of the muscular coat of the bronchial tubes, the calibre of which is thus so much diminished that the air is unable freely to enter the air-vesicles of the lungs. An attack of asthma generally comes on suddenly, usually during the night or early morning, being in some cases preceded by the passing of an unusual amount of urine, inflammation of the eyes and discharge from the nose, or a sensation of tightness of the chest or wheezing, whilst in others it occurs without any warning. During the attack there is a feeling of compression of the chest and inability to breathe, which is often so severe that the patient lays hold of any steady object near him so that he may bring into play all the muscles of inspiration; the face is at first pallid and expressive of the utmost anxiety, but it is afterwards flushed, and as the dyspnœa increases it becomes of a dusky colour with blueness of the lips. Perspiration stands upon the face, the pulse is weak and small, and the distress is so extreme that you might suppose that death would take place from suffocation.

During an attack the chest seems scarcely to expand notwithstanding the forcible attempts to breathe, the percussion note is clear and resonant, the inspiratory murmur very feeble or inaudible, while the expiration is loud and noisy and accompanied by sonorous and sibilant rhonchi. The attacks of dyspnœa are generally followed by bronchitis, from which the patient recovers for a time, until a fresh seizure again prostrates him.

The complaint commonly commences in childhood, and is often associated with eczema of the skin. The frequency of the attacks often lessens, or they may disappear about puberty. When it begins in persons of middle or advanced life it is seldom entirely got rid of, as it is often associated with gout, heart disease, chronic bronchitis, or emphysema of the lungs.

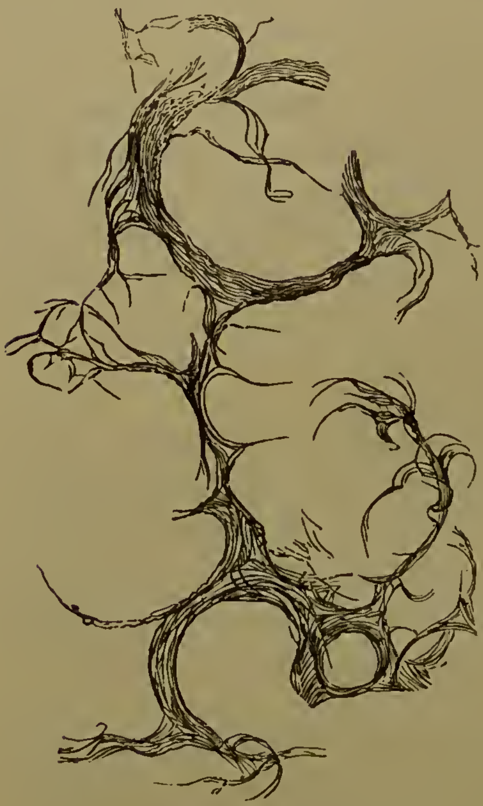
The attacks vary greatly in their frequency; in some they may occur daily, lasting only a few hours, in others the dyspnœa persists for days with intervals of comparative ease, or, on the contrary, they may appear only occasionally. One patient may be free from them in damp weather, another in a dry and bracing climate, some escape the attacks in towns, whilst others can only retain their health by constant residence in the country.

Small particles have been described by Curschmann as being present in the expectoration after an attack of asthma, which, under the microscope, appear to be twisted threads of mucus. Octohedral crystals have been likewise described as occurring in the expectoration, and are supposed to consist of a phosphate of some organic base. In some cases thickening of the mucous membrane of the nares, or nasal polypi, are present in those liable to asthma.

190. *Hay asthma* or *Hay fever* is usually attributed to the irritation excited by the pollen of various grasses, but it may also be produced in very susceptible individuals by the scent of different flowers. It commences with inflammation of the conjunctivæ, nares and throat, followed by cough, expectoration and attacks of asthma. It chiefly shows itself in the hay season.

191. The spirometer is sometimes used to ascertain the state of the lungs in suspected cases of phthisis. It consists of a vessel filled with water, to which a scale is attached. When a person blows through the tube leading into it, the water is displaced, and the vessel on rising marks on the scale the number of cubic inches of air expelled from the lungs. The patient before blowing must take as full an inspiration as possible. Dr. Hutchinson laid down the rule that the breathing volume for a healthy man five feet high is 174 cubic inches, and that eight cubic inches should be added to this for every inch above five feet. The spirometer is not much to be depended upon as a means of diagnosis, for the above rule is not trustworthy, and few

FIG. 46.



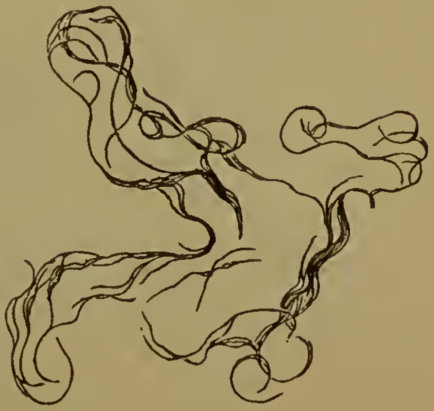
Drawing of a group of air-cells as seen under the microscope.

persons can expire to their full extent without some practice.

192. The microscope is a most valuable aid in the diagnosis of phthisis—indeed, in many cases its indications are more reliable than those of auscultation and percussion. Whenever ulceration takes place in the lungs, minute particles of these organs are expelled in the sputa, which can be separated for examination by the following method:

Prepare a solution of caustic soda, about twenty grains to an ounce of distilled water. Collect all the patient has expectorated during twelve or twenty-four hours—from ten at night to ten the next morning being the best period. Pour this, previously mixed and well shaken with an equal quantity of the soda solution, into a glass beaker, and boil it over a gas or spirit lamp, stirring it occasionally with a glass rod. A test-tube does not answer so well as a beaker. As soon as it boils pour it into a conical glass and add four or five times the amount of cold distilled water. If the mucus is still gelatinous after boiling, you have either added too little soda or not boiled it sufficiently. The cold water carries down to the bottom of the glass any lung-tissue that may be present, where it forms a slight deposit in about a quarter of an hour; if no deposit is visible, put the glass aside for two or three hours. Remove the deposit with a pipette, place it in a glass cell, cover it with a piece of thin glass, and examine it with a one-inch objective. The lung-structure will be often

FIG. 47.

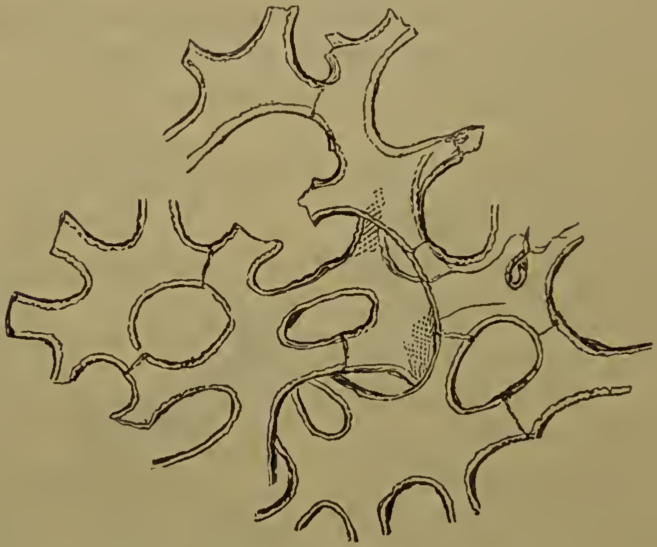


Drawing of single air-cells, the fibres of which are unravelled, as seen under the microscope.

found clinging to hairs and other foreign bodies present in the sputa.

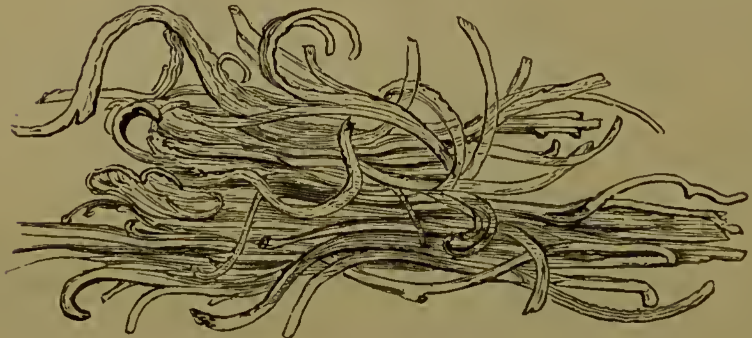
193. The air-cells have the appearance presented in figs. 46 and 47, and are distinguished by the number and arrangement of the fine fibres of which they are composed; sometimes they are expelled in groups of twenty to thirty air-cells, at others only portions of single cells are visible. Bronchial tubes may be recognised by their branching

FIG. 48.



Portions of vegetable structure as seen under the microscope, liable to be mistaken for air-cells.

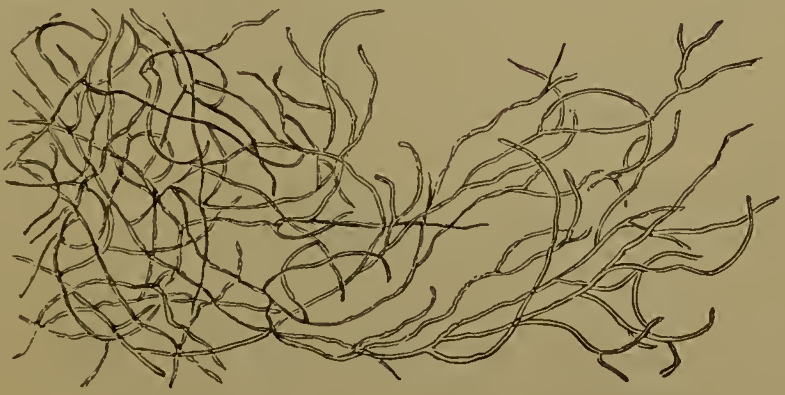
FIG. 49.



Portions of fascia as seen under the microscope.

form, and are sometimes accompanied by fragments of blood-vessels. When only small crepitations can be heard in the lungs, the greater part of the deposit will be found to consist of air-cells; where the signs of a cavity are present you will meet with portions of the bronchial tubes in the sputa; fragments of the blood-vessels can be rarely detected excepting just before or during an attack of hæmoptysis.

FIG. 50.



Portions of fungi, often found in sputa, as seen under the microscope.

A few examinations will enable you to recognise quickly and certainly the air-cells: but at first you must be careful not to confound them with portions of vegetable and animal structures that may be present in the sputa. A piece of the cellular part of a vegetable is represented in fig. 48; you will observe in it the regularity of the size and shape of the cells, the thickness of their walls and the absence of fine fibres. Portions of the fibrous structures of other organs may be generally distinguished by the coarseness of their fibres and the want of cellular arrangement (fig. 49).

You will find this method of examination most useful in acute phthisis, when other means afford you only uncertain results; in chronic catarrh and emphysema where tubercle has been slowly developed and its signs are masked by those of the previous disease; and in that large and difficult class of cases in which the physical signs point only to bronchitis, while the symptoms indicate phthisis. It is also very valuable where frequent hæmoptysis and other symptoms leave you in doubt whether you have to deal with phthisis or cancer of the lung, and it is often the only means of diagnosing with certainty a tubercular cavity from a dilated bronchial tube.

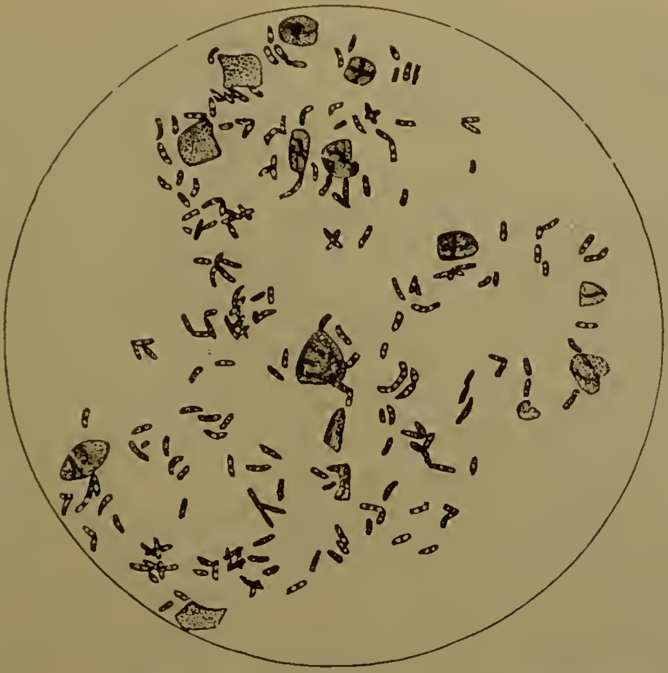
194. It is very important to ascertain whether the bacilli peculiar to tubercle are present in the expectoration. Various methods have been proposed, but the following, recommended by Dr. Heneage Gibbes, is the most simple:

"The stain is made as follows: take of rosanilin hydrochloride two grammes, methyl blue one gramme; rub them up in a glass mortar. Then dissolve anilin oil 3 c.c. in rectified spirit 15 c.c.; add the spirit slowly to the stains until all is dissolved, then slowly add distilled water 15 c.c.; keep in a stoppered bottle.

"To use the stain, spread a little sputum on a cover-glass, and allow it to dry in the air protected from dust. When a specimen is wanted for diagnostic purposes at once it may be dried over a small Bunsen, but for preparations that are to be kept for reference, it is better to dry the sputum slowly in the air. The sputum used should be that coughed up by the patient the first thing in the morning, as later on it may only come from the back of the throat. The sputum having been thus dried on the cover-glass, a few drops of the stain are poured into a test-tube and warmed; as soon as steam rises pour into a watch-glass, and place the cover-glass on the stain. Allow it to remain for four or five minutes, then wash in methylated spirit until no more colour comes away; drain thoroughly and dry, either in the air or over a spirit lamp. Mount in Canada balsam.

"This process gives the most satisfactory results. It brings out the bacilli quite as well as the other processes, and it stains all putrefactive bacteria and micrococci very deeply, so that in one field of the microscope blue micrococci and bacteria may be compared with the red bacilli of tubercle. The stain can be used cold equally well. The cover-glass in that case must be left in the stain for at least half an hour. High powers are not required to see these bacilli; for ordinary clinical work a $\frac{1}{2}$ or $\frac{4}{10}$ is enough to verify their presence" (fig. 51).

FIG. 51.



Tubercle bacilli in phthisical sputum. (ZIEGLER.)

CHAPTER VI

DISEASES OF THE KIDNEYS

The chief diseases to which the kidney is liable are congestion, acute and chronic inflammation, lardaceous degeneration, pyelitis, suppurative nephritis, dilatation, stone, tubercle, and malignant disease.

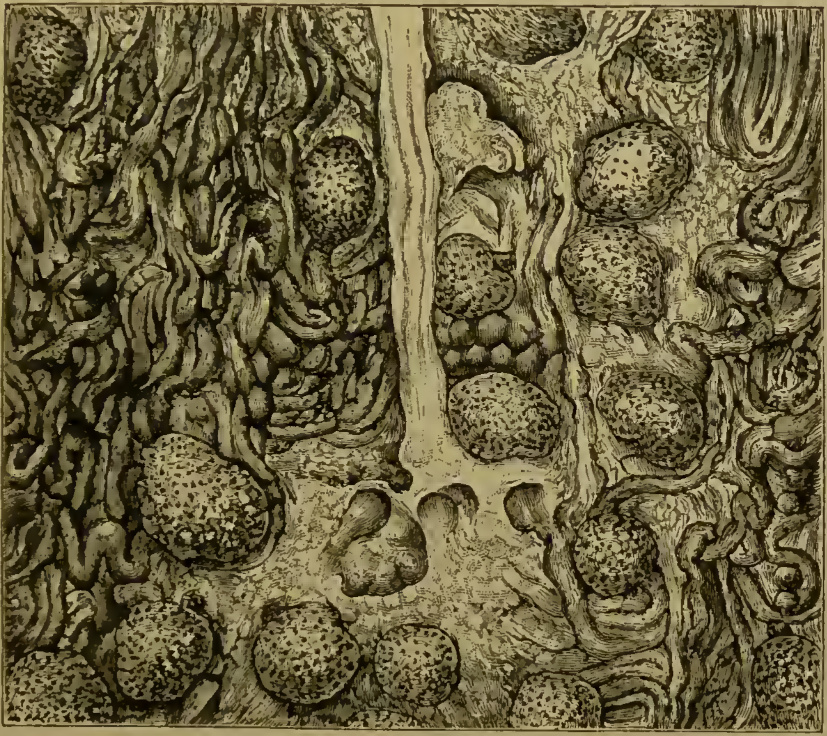
195. CONGESTION OF THE KIDNEY.—The organ is of a dark red colour, is much increased in size, and its structure is tough when the congestion has been of long standing. On a section being made, blood flows freely from it, and its substance, as well as the mucous membrane of the pelvis and calyces, is much congested. Microscopically, the toughness is found to arise from an increased growth of connective tissue, which chiefly occurs in the cortical part. Congestion of the kidney generally arises from valvular disease of the heart, emphysema, or from some other cause which prevents the ready return of the venous blood from the organ.

196. EMBOLISM OF THE KIDNEY is very frequent. The infarction is wedge-shaped, with the base of the wedge at the surface of the organ. As a rule it is pale in colour, with congestion and scattered hæmorrhages round its margin. The infarct gradually undergoes absorption and is eventually replaced by a scar, which produces a deep linear depression upon the surface of the kidney. In cases of ulcerative endocarditis the infarct often suppurates.

197. ACUTE PARENCHYMATOUS NEPHRITIS, OR ACUTE BRIGHT'S DISEASE.—The kidney is much increased in size and weight, its capsule is readily removed, in some cases

the organ is of a deep red colour, but in others of a light yellow, or the surface is irregularly congested and displays here and there minute red spots or patches. On section the cortex is seen to be pale, swollen, granular, and much thicker than normal, while minute red dots mark the position of the inflamed glomeruli. In advanced cases yellow striæ, arising from fat in the tubules, occur in the cortex and pyramids. Microscopically, the convoluted tubules present cloudy swelling of their epithelium, which subsequently becomes detached from the basement membrane. Occasionally the tubules are filled with blood or hyaline cylinders. In the later stages of the disease the epithelium undergoes fatty degeneration and the tubules are seen to contain drops of oil and granular

FIG. 52.



Showing the microscopical appearances in acute parenchymatous or tubular nephritis. (SIR T. GRAINGER STEWART.)

débris. The capsules of the Malpighian bodies are sometimes filled with blood; in other cases the Malpighian bodies appear dense and granular, whilst their capillaries are greatly congested (see fig. 52).

Acute nephritis usually arises from (1) exposure to cold; (2) scarlatina; (3) diphtheria and other specific fevers; (4) pregnancy; (5) cantharides and turpentine. It is not infrequently followed by chronic Bright's disease.

198. CHRONIC NEPHRITIS.—Much confusion has arisen from various disorders of the kidney having been described under the name of "Bright's disease." At least four different forms of chronic disease appear to have been thus confounded—viz., chronic parenchymatous nephritis, or, as it is often called, the large white kidney, fatty kidney, lardaceous kidney, and chronic interstitial nephritis, or granular kidney. In all of these albumen and casts of the urinary tubules may be found in the urine. All forms of Bright's disease, whether acute or chronic, are apt to give rise to dropsy, which is an effusion of the serum of the blood into the subcutaneous connective tissue (œdema), or into the cavities of the body. This is supposed to take place from the blood being altered in its composition through the retention of various excrementitious substances (urea, &c.), which the kidneys, when healthy, remove. The presence of these substances in the circulation also gives rise to uræmic poisoning, which is characterised by convulsions and coma.

199. CHRONIC PARENCHYMATOUS NEPHRITIS, often called the LARGE WHITE KIDNEY.—The organ is much increased in size, the capsule peels off readily, the surface is white and smooth, with patches of red colour or arborescent veins upon it. On section, the cortical part is seen to be much increased in volume, is of a pale yellow colour, and markedly striated; the pyramids are often congested, but otherwise the medullary part is usually normal. Microscopically, the tubes are dilated and greatly distended with cells and fatty and granular materials, by which their chan-

nels are obstructed. At a later stage the tubes lose their lining membrane, and become atrophied; the Malpighian bodies are more opaque than normal and are usually enlarged.

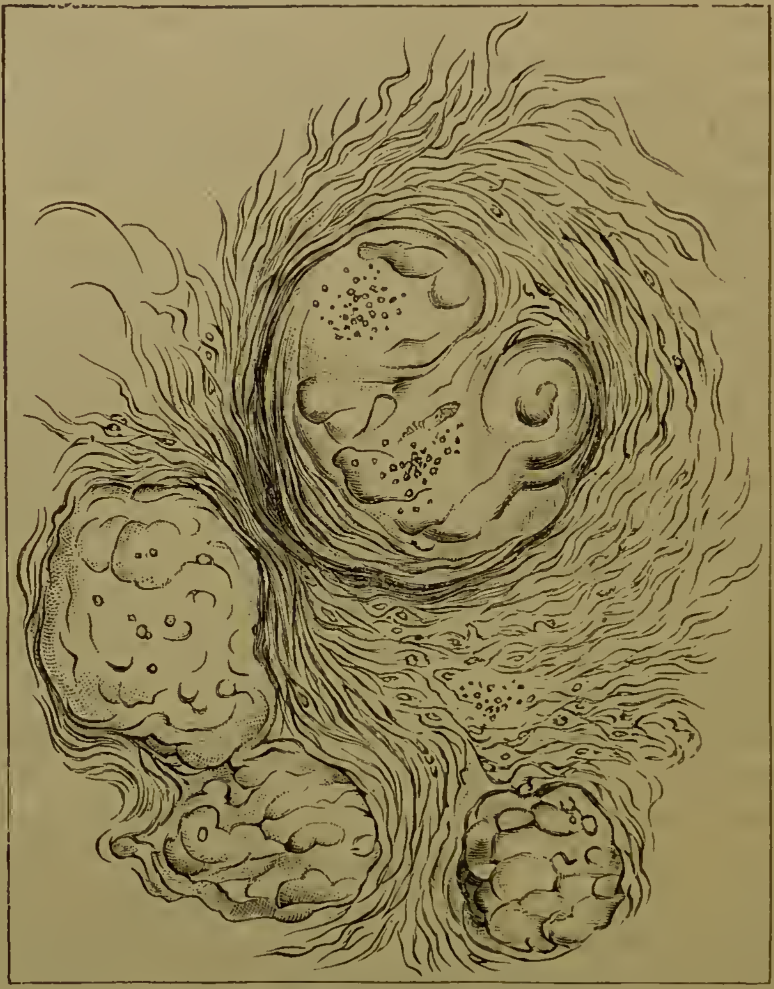
200. The CONTRACTED FATTY KIDNEY represents the last stage of parenchymatous nephritis. The organ is greatly reduced in size, and has an irregular, lobulated appearance. The tissue is pale and flabby, and the capsule only adherent at certain spots. On section the cortex is markedly diminished. Microscopically, the tubules are partly atrophied and partly dilated and filled with fatty material. The glomeruli are thickened, and newly formed fibrous tissue exists between the tubules.

201. LARDACEOUS, AMYLOID, or WAXY KIDNEY.—The kidney is usually large and hard, and its capsule is readily stripped off. On section it has a more or less translucent, waxy, bloodless appearance, and the Malpighian bodies appear as semi-translucent dots. A solution of iodine stains the affected tissues of a reddish-brown colour. Microscopically, the smaller arteries are generally thickened, the morbid change first affecting the Malpighian bodies and their vessels, the tubes becoming afterwards implicated. This disease is usually associated with a similar condition of the liver and spleen in persons affected with phthisis, syphilis, suppuration, caries of the bones, or wasting disorders. The excretion of urea is less interfered with in this than in the other forms of chronic Bright's disease.

202. INTERSTITIAL NEPHRITIS, GRANULAR, or CONTRACTED KIDNEY.—The whole organ is much reduced in size, the capsule is thickened, adheres firmly, and, on being peeled off, leaves portions of its tissue on the exterior of the gland. The surface is irregularly covered with small prominences; in other cases *cysts* are apparent. On a section being made, the cortical part is seen to be much reduced in thickness, and the whole structure is dense, tough, coarse, and fibrous. Microscopically, in the earlier stages the connective tissue is very vascular and infiltrated with cells, which are afterwards converted into fibrous tissue. The pressure exerted

by this new-formed tissue upon the adjoining parts produces shrinking and distortion of the renal tubes, which are often found devoid of epithelium. The Malpighian bodies are shrunken and fibrous, and the inner coats of the arterioles

FIG. 53.



Microscopical appearances in interstitial nephritis.
(SIR T. GRAINGER STEWART.)

much thickened. In some cases cysts exist in such numbers that the whole organ seems to be composed of them. These cysts seem to originate in the expansion of small portions of the uriniferous tubes which have become blocked up, or in dilated Malpighian bodies (fig. 53).

203. In Pyelitis, or inflammation of the mucous membrane of the pelvis and calyces of the kidney, the membrane is red, thickened, sometimes ulcerated, and covered with muco-purulent secretion or with pus. It is generally caused by the irritation of a stone in the kidney, the extension upwards of inflammation from the bladder or urethra, the accumulation and decomposition of urine in the pelvis, or by tubercular deposits in the mucous membrane. It is apt to give rise to dilatation of the organ, and it is usually present in all cases of dilated kidney.

204. Suppurative Nephritis, or inflammation of the substance of the kidney terminating in suppuration, is a rare disease, excepting as the result of some affection of the bladder or urethra, of pyæmia, or of irritation set up by a calculus. The morbid appearances are those of congestion, attended by deposits of pus, chiefly in the cortical part. It is generally accompanied by pyelitis. The pus is usually discharged with the urine, but abscess of the kidney may open into the pleura, colon, or other neighbouring organ, or in rare cases it may make its way to the surface of the body and burst externally.

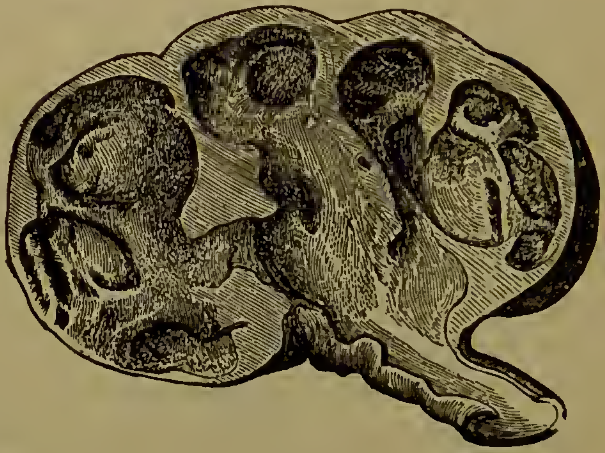
205. Dilatation of the Kidney.—In an extreme degree of this disease the organ is much increased in size, is lobulated, and seems as if converted into a bag containing pus or urine. When the sac contains pus the disease is named *pyonephrosis*, whilst the term *hydronephrosis* is applied to it if it is filled only with a watery urine. On a section being made of a dilated kidney, the cortical part may be so greatly atrophied that it can be scarcely recognised, the medullary portion is compressed and flattened, the pelvis and infundibula are dilated, and their lining membrane is much congested from the accompanying pyelitis (fig. 54). It is produced by the flow of urine being obstructed by a calculus, or by some affection of the ureters, bladder, or urethra.

206. Stone in the Kidney is of frequent occurrence. The calculi may be formed in the substance of the organ or

in the pelvis. In the latter case they often attain considerable dimensions, moulding themselves into the shape of the pelvis and calices, and sometimes extending into the mouth of the ureter. They may be composed of uric acid, of phosphates, of oxalate of lime, or of cystine. Calculi in the kidney are apt to produce hæmaturia and severe pain. If they gain access to the pelvis, pyelitis may result, while if they block the ureter, hydronephrosis is produced.

207. Tubercular Disease of the Kidney.—In some cases the deposits exist in the form of small scattered grey tubercles in the cortical part of the gland, associated with general tuberculosis; in others there are yellow nodules in the cortical part which soften and open into the infundibula, or the whole organ may have been destroyed, and after death you find the capsule enclosing a putty-like mass of tubercular matter intermixed with the scanty remains of the original structures. The disease occasionally commences by tubercular deposits in the pelvis of the kidney. Tubercular disease of the kidney is very often associated with a similar affection of the supra-renals, prostate gland, bladder, or ureters.

Fig. 54.



Hydronephrosis. (Virchow.)

208. Tumours.—*Cystic disease of the kidney* is usually

congenital. The whole organ is converted into a mass of cysts of larger or smaller dimensions, which often form rounded prominences of considerable size upon the surface of the kidney. The contents of the cysts consist of a pale fluid containing urea and often albumen.

Primary sarcomata mostly occur in infants. They are chiefly of the round-celled and spindle-celled varieties and often attain an immense size. *Primary cancer* is met with at a late period of life, and usually affects only one kidney. *Echinococcus* is of occasional occurrence, and sometimes co-exists with hydatid cyst of the liver.

209. The symptoms that should lead you to suspect disease of the kidneys are anæmia, dropsy, vomiting in the early morning, attacks of bronchitis, diarrhœa, frequent micturition at night, intractable indigestion, or convulsions. Indeed, as most of the diseases of this organ are unaccompanied by pain, it is advisable for you to ascertain the state of the kidneys in any case in which the symptoms are obscure or threatening. The urine supplies you with the best means of determining if the kidneys are healthy; you should therefore practise yourself in the examination of it as carefully as in auscultation and percussion.

210. Observe the colour of the urine, whether it is of lighter or darker tint than usual, or if it is tinged with blood or bile.

Ascertain its specific gravity; float a urinometer in it, and observe what number on the scale is on a level with the upper surface of the liquid. The urinometer is so constructed that it floats with the index at zero when placed in distilled water. The specific gravity of healthy urine varies from 1015 to 1025. If you multiply the last two figures of the specific gravity by 2, you obtain a rough estimate of the amount of solid materials in the urine—thus, if you have 1000 grains of urine with a specific gravity of 1020, that amount will probably contain 40 grains (20 + 2) of solid matter. But as the density of the urine varies greatly at different periods of the day, it will be necessary to collect all that has been passed during twenty-four hours, before you can arrive at any trustworthy conclusion on this point.

211. Test for the presence of albumen. Boil about a drachm of the urine in a test-tube, having previously added ten or fifteen drops of nitric acid; if albumen is present, the fluid becomes opaque. Observe the proportion of albumen when it has fallen to the bottom of the tube; as, for instance, about one-quarter or one-sixth of the liquid examined. The opacity is most readily seen by inclining the test-tube, partially filled with the suspected urine, over the spirit-lamp, so that the *upper layer* is first heated. Another plan is to pour some nitric acid into a test-tube, and then allow the urine to flow gently down the side of the tube, so that the liquids may meet without mixing. At their point of junction an opaque layer is visible if albumen be present. In testing for albumen it is the safest plan to use both heat and nitric acid. Heat alone often fails to produce coagulation when the urine is alkaline, and the presence of only a drop or two of the nitric acid tends to hinder rather than assist it. On the other hand, a cloudy appearance often takes place in boiled urine from the precipitation of phosphates, which disappears on the addition of an acid. Nitric acid alone sometimes causes turbidity by the precipitation of the urates, in other cases by the formation of crystals of nitrate of urea. In persons who are taking copaiba the addition of nitric acid to the urine will sometimes produce a turbid appearance, from the precipitation of the resin of copaiba, but this is dissolved by heat.

A saturated solution of picric acid, a solution of the ferrocyanide of potassium along with acetic acid, or a solution of the potassio-iodide of mercury also precipitates albumen. These are better fitted for ordinary clinical work than nitric acid, as they are not so destructive to the clothes, in case any of the reagent should be spilled.

If you find albumen, begin at (214).

212. If you do not find albumen, next test for sugar. Pour into a test-tube a small quantity of the urine, add to it a few drops of a dilute solution of sulphate of copper, and about half as much liquor potassæ as urine. If sugar be present, the precipitate first formed is redissolved, and the liquid assumes a dark blue colour. When boiled, a *reddish-brown precipitate* of oxide of copper will be deposited, and the same change will occur if the fluid be allowed to stand for twenty-four hours without being heated. If the urine contain albumen, this must be first separated by filtration after coagulation by heat and nitric acid, for the presence of albumen prevents the precipitation of the oxide of copper.*

If you find sugar, pass on to (250).

213. Although neither albumen nor sugar be present, you may still derive much information from a further examination of the urine; pour a portion of it into a conical glass, leave it at rest for a few hours, so that any precipitate that may form may have time to subside to the bottom of the glass, and then pass on to (256).

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* In testing for sugar it is more convenient to use Dr. Pavy's solution than the liquor potassæ and sulphate of copper. The solution consists of sulphate of copper 320 grains, tartrate of potash (neutral) 640 grains, caustic potash 1280 grains, distilled water 20 fluid ounces. The tartrate of potash and caustic potash are to be dissolved together in one portion of the water, and the sulphate of copper alone in the other; the two solutions are then to be mixed. Boil a small quantity of this solution in a test-tube and add to it a little of the suspected urine, drop by drop, until you have used rather less than an equal quantity of the solution. If sugar be present, an intense opaque yellow colour is formed; if no such precipitate has taken place when the liquor has become cold, the urine is not saccharine.

SECTION I

You Find the Urine Albuminous

214. You must not conclude that the patient has a disease of the kidneys because you find albumen in the urine, for this may arise from fever, gout, cholera, pregnancy, and many other conditions; but if, *after frequent examinations*, you find albumen, pus, or blood, or if, along with the albumen, there are "tube casts" in the urine, and the general symptoms of kidney disease are well marked, you may safely diagnose a morbid state of the urinary organs. Under certain circumstances, the presence of albumen is not constant, but presents itself only at certain times of the day. Thus it may be absent in the early morning, but may appear after food or exercise.

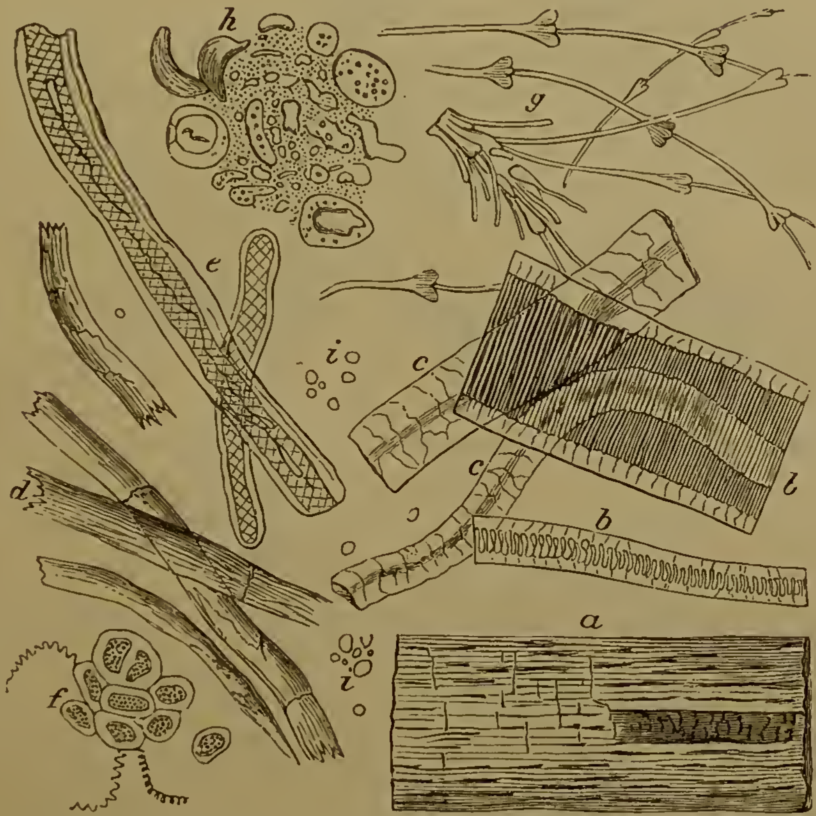
215. Before beginning to study the urinary sediments with the microscope, it will be an advantage for you to accustom your eye to the appearances presented by various foreign bodies that are frequently found in urine. Fig. 55 will show you such as are most generally met with.

216. In cases of inflammation of the kidney "casts" are generally to be discovered in the urine by the microscope. They are never found in normal urine, and as they do not occur in merely functional albuminuria, they may be always looked upon as an evidence of disease.

217. To examine the urine for casts of the uriniferous tubes, pour it into a conical glass, and set it aside for a few hours; remove with a pipette a small quantity of the deposit at the bottom of the vessel, place it on a slide, or, what is better, in a shallow cell, cover it with a thin piece of glass, and examine it with a microscope. You can detect casts of the tubes with a one-inch objective, but a quarter-inch objective will better enable you to study their characters.

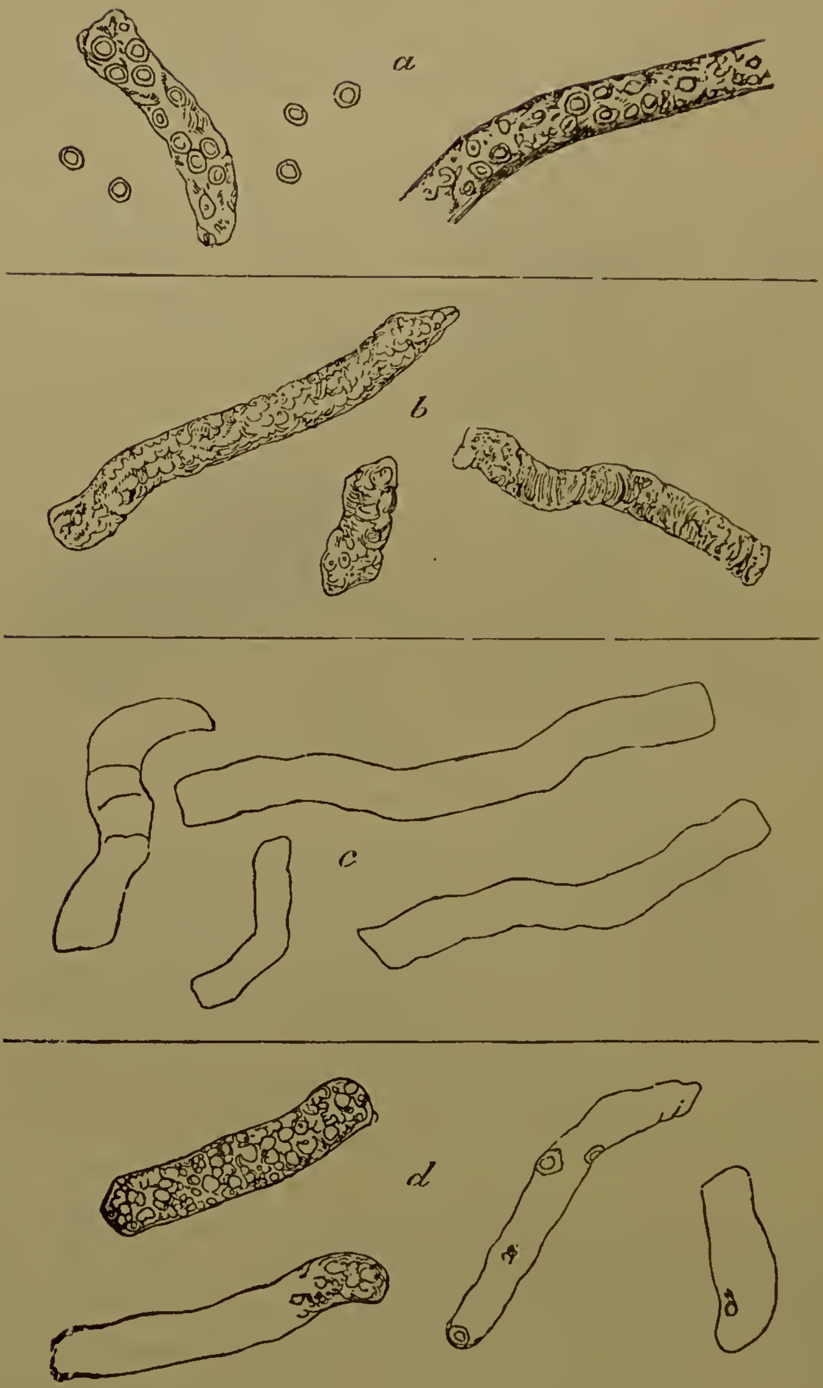
The casts appear under the microscope as solid moulds or long narrow tubes; they are formed by the coagulation of the albumen of the blood in the uriniferous tubes, or of mucus, which, when washed away by the urine, carries with it portions of the epithelium and occasionally blood-corpuscles. Thus you may judge, to a certain extent, of the condition of the secreting part of the kidney by the appearances presented by the casts. In doubtful cases if you find no casts do not be content with a single examination, but repeat it from time to time, letting the urine remain for twelve hours in the glass before you remove the deposit.

FIG. 55.



a. Fragment of human hair. *b.* Cat's hair. *c.* Hair from a blanket. *d.* Flax fibres. *e.* Cotton fibres. *f.* Fragments of tea-leaves. *g.* Portions of feathers. *h.* Bread-crumbs. *i.* Free oil globules. (BEALE.)

Fig. 56.



(Sir T. Grainger Stewart.)

There are four principal forms of casts.

1. *Transparent*, or *hyaline casts*, in which there is no trace of structure (*c*, fig. 56). They vary greatly in diameter—from $\frac{1}{3000}$th to $\frac{1}{500}$th of an inch and probably vary also in chemical composition; they may easily escape observation, and are best brought into view by throwing the light upon them obliquely, or by adding a drop of a weak watery solution of iodine to the specimen.

2. *Epithelial casts* are covered by the epithelial cells of the uriniferous tubes (*a*, fig. 56). Their presence shows that the tubes are still lined by epithelium and that the disease is recent. The cells are usually granular and opaque.

3. *Granular casts* have a dark granular appearance, and are usually about $\frac{1}{700}$th of an inch in diameter. They are produced in tubes whose epithelium is undergoing disintegration (see *b*, fig. 56). In many recent cases you may meet with casts which seem granular from the deposition upon them of urate of ammonia, but they become transparent when warmed.

4. *Casts loaded with fat*, or covered with cells containing fatty granules, if *numerous and persistent*, generally indicate fatty degeneration of the kidney (see *d*, fig. 56). Even in recent cases you often see a *few* casts rather oily.

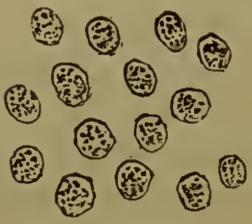
Sometimes you find blood (see *a*, fig. 56) or even pus cells, entangled in the tube casts. The size of the casts varies according to the part of the kidney in which they have been formed, and with the state of the lining membrane of the tubes. If the epithelium be still adherent the casts will be small; if it be detached, the casts will be, of course, larger. The epithelium of the bladder, ureters, and pelvis of the kidney is apt to present itself in the urine, whenever inflammation exists in these parts. The appearance of the cells may be so similar to that of cancer cells, that it may give rise to a mistake in diagnosis (figs. 62 and 63).

218. Instead of casts you may find the deposit to consist of pus (fig. 57). You detect pus, either by adding to the

deposit liquor potassæ, which converts it into a thick, glairy mass, or by examination with the microscope. Pus cells are round, $\frac{1}{2000}$th to $\frac{1}{3000}$th of an inch in diameter, and have a granular appearance. When acetic acid is added they become transparent, and display from one to four nuclei. If the deposit is formed of pus, pass on to (231).

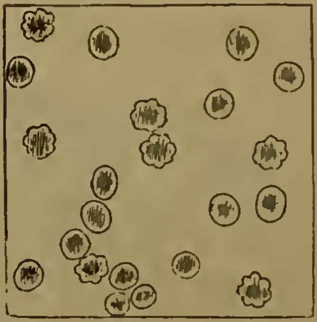
219. The deposit may consist of blood, or the urine may be coloured with blood and deposit fibrine of a brownish-red colour. After remaining long in urine, blood-corpuscles often have a ragged, irregular outline; they are about $\frac{1}{3000}$th part of an inch in diameter, and have no nucleus (fig. 58). If there is blood, pass on to (238).

FIG. 57.



Pus cells in urine as seen under the microscope.

FIG. 58.



Blood-corpuscles in urine; some have an irregular outline.

A. The urine is albuminous and contains tube casts.

220. Inquire if the disease has taken place suddenly or gradually; if *acute*, begin at (221); if *chronic*, pass on to (223).

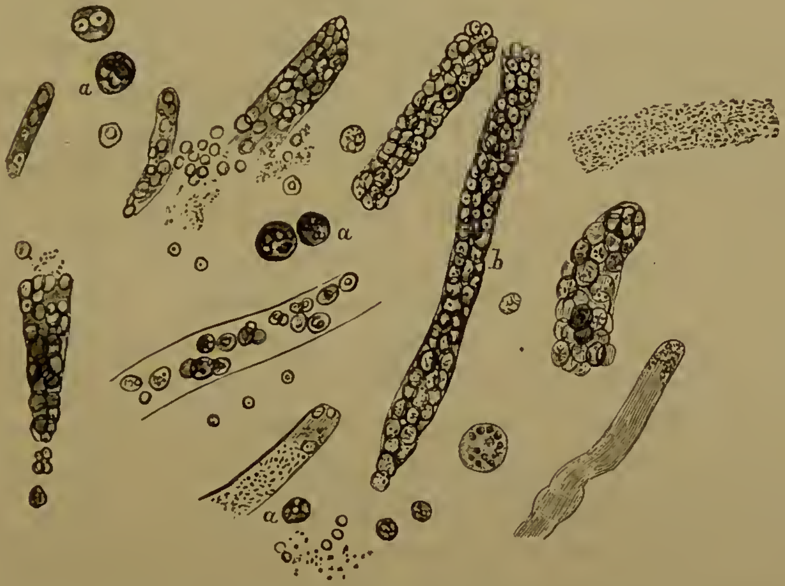
221. *a.* The urine is passed frequently, is scanty, high coloured, of high specific gravity, very albuminous, smoky, sometimes bloody, or deposits a dirty brown sediment; the tube casts are epithelial, or transparent, and mixed with blood-cells and particles of fibrine. The patient has dropsical

swellings of the body, face, and limbs, a quick pulse, thirst, dry skin, and temperature above the normal.

The disease is *acute parenchymatous nephritis* (*acute Bright's disease*).

The more severe cases of acute Bright's disease are generally ushered in with chilliness or shiverings, followed by headache, thirst, nausea or vomiting, and pains of the loins; the secretion of the urine may be entirely suppressed, but usually a small quantity is passed. The slighter cases may be attended with dropsy alone, the patient feeling himself, in other respects, in good health. The temperature, which is at first somewhat elevated, soon falls to the normal point and may remain so during the whole of the subsequent illness. Whenever, therefore, you observe a persistent elevation of temperature after the first few days, you may suspect some local complication. In children the complaint generally arises from scarlatina, in adults from exposure to wet and cold, but it may follow the use of

FIG. 59.



Drawing of the red deposit from urine in acute tubular nephritis.
b. Casts covered with renal epithelium.

turpentine, cantharides, or other irritating drugs. It not infrequently first appears during pregnancy.

The presence of blood in the urine shows that the affection is recent and the congestion severe. Recovery is sometimes accompanied by the passage of large quantities of urine. Signs of exudation into the pleura or peritoneum are often observed along with the dropsy of the face, limbs and trunk. In very rare cases œdema of the larynx proves a source of danger. In others, and especially in children, cough and difficulty of breathing resulting from bronchitis are prominent symptoms, whilst in others acute inflammation of the pleura, pericardium or peritoneum presents itself. Headache, vomiting and uræmic convulsions are apt to occur whenever the amount of urine is much diminished, and especially if the secretion of it has been suppressed.

222. You must remember that attacks of acute tubular nephritis often occur during the course of the more chronic forms of Bright's disease: you must therefore, in all cases, carefully inquire into the history of the affection before deciding that the complaint is recent. Acute tubular nephritis often becomes chronic, and then presents the symptoms of chronic Bright's disease.

The chronic diseases under this head are, chronic parenchymatous nephritis (large white kidney), fatty kidney, lardaceous kidney, and interstitial nephritis (granular or contracted kidney).

223. *a.* The urine is not diminished in quantity, is generally pale, of low specific gravity and albuminous, the tube casts are mostly granular, or transparent; there are œdema of the body and limbs, anæmia, debility, loss of appetite, and occasional vomiting.

The disease is *chronic parenchymatous nephritis* (*large white kidney*).

The pallor of the lips and skin, and the swelling of the face and limbs, will at once arrest attention, and enable you to guess at the nature of the disease before you examine the urine. The dropsy is an early symptom and begins in the eyelids, feet, and ankles. The complaint is usually accompanied by bronchitis, hydrothorax, disordered digestion, vomiting in the early morning, or diarrhœa. The patient is liable to inflammation of various organs; therefore, if there be any increased heat of skin, pains of the chest, or other symptoms indicative of inflammation, carefully examine the state of the heart and lungs with the stethoscope.

Chronic parenchymatous nephritis is most common between the ages of twenty and thirty-five, and is rare above forty-five. It often occurs as the consequence of acute tubular nephritis, follows exposure to cold and wet, or may present itself in the later stages of chronic phthisis. When atrophy of the kidney takes place, the urine is pale and copious, with a low specific gravity and a diminished amount of albumen, and sometimes the left side of the heart becomes hypertrophied and dilated.

224. Chronic parenchymatous nephritis may be confounded with the chronic form of kidney disease that so often results from disease of the heart (*cyanotic induration*). The urine, however, in the former is of a paler colour, the specific gravity is lower, and it contains a larger amount of albumen. In heart disease dyspnœa and palpitation precede the dropsy, which is at first confined to the lower limbs; the physical signs of mitral or tricuspid disease are well marked, and the liver is enlarged and tender.

225. *b.* If, in addition to an albuminous state of the urine, and the general symptoms of disease of the kidney, you find *numerous* casts loaded with fat, or a quantity of free oil, you may diagnose that the kidneys are in a state of *fatty degeneration.*

226. *c.* If with pale and albuminous urine of low specific gravity (1005 to 1015), you find a few casts, mostly of the large waxy form, in a person who is liable to severe diarrhœa, or has diseased bone, phthisis, enlarged liver or spleen, or who has suffered greatly from syphilis, you may suspect the disease to be *lardaceous kidney.*

At first the amount of albumen may be small, but it usually increases as the case progresses. Dropsy is rarely excessive, but in some instances diarrhœa is a prominent symptom. It is rare to meet with the enlargement of the heart so common in other chronic diseases of the kidney. The deposit from the urine is usually scanty, and the casts are not numerous. In some instances they can be stained with iodine, but this is not common.

227. *d.* The urine is pale, increased in quantity, of low specific gravity and albuminous. The tube casts are mostly large and granular or hyaline. The patient is thin, pallid, feeble, and suffers from dyspepsia, dyspnœa, and from some œdema of the legs. The skin is harsh and dry.

The disease is *granular kidney* (*interstitial nephritis*).

The disease is always insidious in its commencement. The patient sometimes complains only of severe headaches, or may suffer from general debility, vomiting, nausea, loss of appetite and dyspeptic symptoms. In others, the earliest indication of illness is an attack of asthma or bronchitis, or he is suddenly seized with convulsions or paralysis, or loss of sight from albuminuric retinitis may lead him to seek medical advice. He is generally forced to rise frequently at night to pass urine, which is pale and copious. The amount of albumen remains small, the specific gravity is low, and there is a great diminution in the quantity of urea and phosphoric acid excreted. Albumen may be absent for a considerable time. Sooner or later hypertrophy of the heart becomes apparent, its impulse is increased, the first sound at the apex is dull, the second sound is louder at the right second intercostal space than on the opposite side, the pulse is full and incompressible, the breathing becomes more difficult in proportion as the heart affection increases, and there is a tendency to bronchitis. The patient gradually loses flesh and strength, and is liable to mental depression. Death generally takes place from apoplexy or paralysis, but in other cases it results from pleurisy, pneumonia, or pericarditis. The disease occurs chiefly in males, is most frequent between forty and sixty years of age, and is most common in persons who have suffered from gout or lead poisoning.

228. Granular kidney is mainly distinguished from the other forms of chronic Bright's disease by the paleness and increased quantity of the urine, by its low specific gravity (often below 1010) and the small amount of albumen it contains; by the disease occurring chiefly in middle-aged or old persons, and in those who have suffered from, or are hereditarily predisposed to gout, by the slowness of its course, the frequent absence or small amount of dropsy, and its association with neuro-retinitis, hypertrophy of the heart, or cirrhosis of the liver.

229. Uræmic poisoning is apt to occur in all the above forms of kidney disease, because the elimination of the solid parts of the urine (urea, &c.) is lessened. It generally first shows itself by headache, or a feeling of weight or tightness in the forehead, dimness of sight, or confusion of memory. Convulsions may come on suddenly, or the patient may be attacked with apoplexy. In other cases intense difficulty of breathing occurs from œdema of the lungs, or the patient is prostrated by severe vomiting or diarrhœa, or signs of acute inflammation of the pleura, pericardium, or peritoneum present themselves.

230. *Cyanotic induration* of the kidneys constantly results from mitral disease or from dilated heart. The urine is generally scanty, of high specific gravity, is very acid and contains albumen; hyaline casts may be present, but they are few in number, and epithelial and granular casts are absent. It may be distinguished from the granular kidney by the urine being scanty, very acid, of high specific gravity, instead of being copious, pale and of low specific gravity, by the history of rheumatic fever or of emphysema, by the enlargement of the liver and by the dropsy first being confined to the lower limbs.

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF THE PRINCIPAL DISEASES OF THE KIDNEYS.

	ACUTE NEPHRITIS.	CHRONIC PARENCHYMATOUS NEPHRITIS.	GRANULAR KIDNEY.	LARDACEOUS KIDNEY.
Etiology	Scarlatina, &c., mostly in young persons	Often follows acute attacks, cold and wet, usually in early or middle life	Gout, mostly after forty years old	Follows long-standing suppuration, syphilis, &c.
Commences	Suddenly	Often follows an acute attack	Insidiously	Slowly
Co-existing diseases	None	In old cases hypertrophy of heart	Hypertrophy of heart	Lardaceous disease of liver and spleen
Pulse	Soft and normal	Weak, otherwise normal	Large, full, high tension	Normal
Dropsy	Very common and general	Common and general	Rare until final stage	Not common
Uræmia	Frequent	Frequent	Frequent in late stages	Rare
Inflammation of serous membranes	Frequent	Frequent	Rare	Rare
Amount of urine	Scanty	Slightly diminished	Excessive	Copious
Specific gravity	High	Diminished	Low	Low
Amount of albumen	Large quantity	Large quantity	Small, may be absent	Large quantity
Blood in urine	Often blood-stained	None	Rare	None
Casts	Numerous, epithelial	Numerous, fatty	Few, granular	Few, waxy

231. **B. The urine is albuminous, contains no tube casts, and deposits pus.**

You may often find, with the aid of the microscope, a few pus-corpuscles in the urine of persons in perfect health, or you may see them entangled in the tube casts in cases of acute or chronic nephritis. I here allude only to a deposit of pus large enough to be evident to the eye of the observer.

232. The pus may result from inflammation of other parts of the genito-urinary organs than the kidneys, or from abscesses bursting into them. If the patient is a female, ascertain if she suffers from leucorrhœa, or any other affection of the uterus or vagina. In the male, the urethra, prostate, or bladder may be in fault. Inquire if he has been affected with stricture of the urethra, or stone in the bladder, if there is frequent desire to pass urine, or difficulty in so doing, also if there is tenderness in the perineal or hypogastric regions. If you can find no evidence of disease in the uterus, vagina, bladder, or urethra, the pus probably proceeds from the kidney. When the pus proceeds from the kidney, the urine is usually acid and devoid of mucus: when derived from the bladder it is more generally mixed with a quantity of mucus, the urine is alkaline and the pus may be changed by decomposition into a viscid mass, mixed with ammonio-magnesium phosphate.

The two diseases of the kidneys capable of giving rise to pus in the urine are both chronic, and are—pyelitis, with or without dilatation of the kidney, and tubercle of the kidney.

233. *a.* Together with a deposit of pus in the urine, you can feel a fulness, or a smooth immovable tumour, in the lumbar region; there is tenderness on pressure and the patient complains of pain in the loin, thigh, and testis. There are usually fever, shiverings, debility, and night sweats.

The disease is *pyelitis, with dilatation of the kidney (pyonephrosis.)*

Pyelitis may be either acute or chronic. It is usually preceded by the symptoms of the affection from which it has arisen. When acute, the first indication is generally a severe rigor followed by fever of an intermitting or remitting type, and the rigors are apt to recur at frequent intervals. In some there is severe pain of the back, in others this is absent, but in most cases there is tenderness over the kidney on deep pressure or on percussion. Nausea, vomiting, thirst and loss of appetite are almost always present, the tongue is often brown, the pulse rapid, and emaciation takes place quickly. The urine at first is acid, not necessarily albuminous, but it soon presents albumen and pus, which latter is often passed in large quantities. The chronic form may follow the acute or may come on gradually. Rigors and fever may be absent, or occur only occasionally, but the urine always contains pus and albumen.

If there is no obstruction to the flow of the urine the kidney does not dilate, but if from any cause the urine is prevented from escaping from the pelvis, dilatation takes place and a tumour can be felt in the loins. In case the secretion of the affected kidney is from any cause retained, the urine may be quite free from pus, but the tumour in the loins will increase in size, and rigors will become more constant. As soon as the contents of the pelvis again escape, pus reappears in the urine and the constitutional symptoms abate.

The size of the tumour in the loin varies from time to time, and corresponds to the amount of pus discharged with the urine. In stout persons, or where the dilatation is small, you may not be able to feel the enlarged kidney.

This disease is generally produced by stricture of the urethra, a stone in the urinary passages, tubercular disease of the kidney, and, in the female, by cancer of the uterus compressing the ureters. When it results from stricture, the diagnosis is very difficult, as the bladder is generally at the same time diseased. If the complaint has been produced by a stone in the kidney, which is the most general cause, you usually have a history of severe pain in the loins, attended by occasional attacks of hæmaturia, to guide your opinion.

234. *b.* You find a deposit of pus in the urine of a patient who has not suffered from the causes of dilated kidney, but who presents indications of tubercular disease of the lungs or other organs.

The disease is probably *tubercle of the kidneys.*

This disease is comparatively rare, and seldom exists in adults without the presence of tubercle in the lungs. The kidney may be enlarged, but this is not invariable. Sometimes hæmaturia is the earliest symptom. As tubercular disease occasionally leads to dilatation of the kidney, it is advisable to examine the state of the lungs whenever pus exists in the urine. The presence of a yellow cheesy matter, insoluble in acetic acid, in the urine, is by many considered an indication of the presence of tubercle. This disease is so often associated with a similar condition of the prostate gland and testis, that these organs should be always examined when you suspect it. Tubercle bacilli may be generally detected in the urine.

235. *Suppuration* may occur in the substance of the kidney, and may form an abscess of considerable size, or appear as numerous small, scattered collections of pus (pyelonephritis). It generally results from pyelitis, or from some affection of the urethra, prostate or bladder, that has interfered with the discharge of the urine. The symptoms are often very obscure, but are usually ushered in with rigors, followed by fever of an intermittent or remittent type, great prostration of strength, a rapid, feeble pulse, and by profuse sweatings. There is rarely any pain although some tenderness of the loins can in most cases be detected on percussion. The urine generally contains pus, sometimes blood, but in other instances it is only very scanty and high coloured, and may be free from albumen and pus. The tongue soon becomes brown, the face flushed,

and the patient drowsy. In most cases he gradually sinks into a state of coma.

236. Suppurative nephritis is most likely to be mistaken for ague, on account of the rigors which in some instances recur at regular intervals. In it, however, the fever is continuous, not intermitting, as in ague; there is more marked prostration of strength, there is a history of cystitis, or some other affection of the bladder or kidney,

FIG. 60.

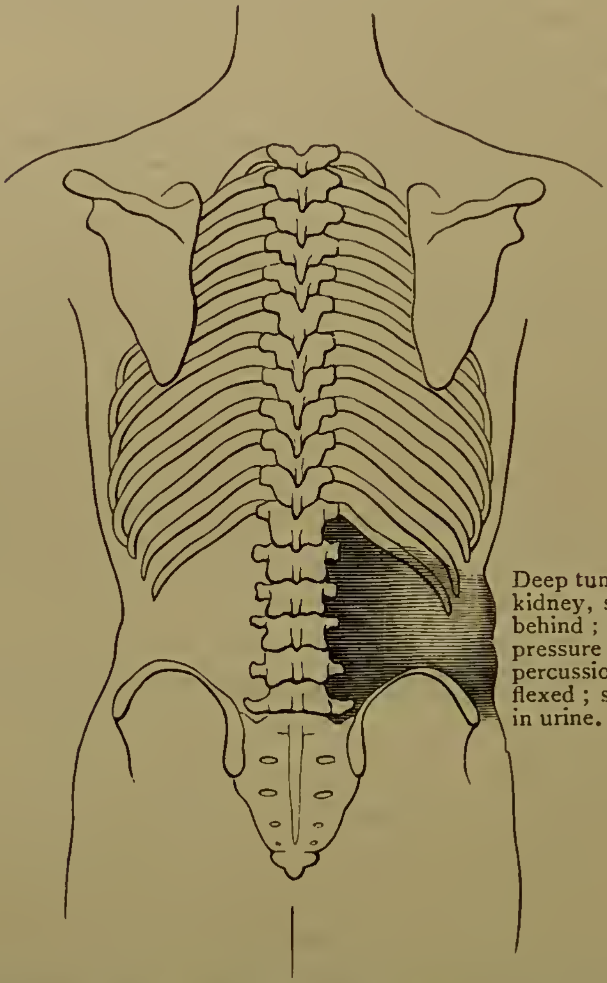

Deep tumour in front of kidney, swelling also behind ; tenderness on pressure ; dulness on percussion ; thigh often flexed ; sometimes pus in urine.

Diagram of the physical signs in perinephritic abscess.

and the patient has, in most instances, not resided in a malarious district.

237. Inflammation around the kidney (perinephritis) is sometimes a consequence of calculous or tubercular pyelitis, but it may also arise from an injury to the loin, from pyæmia, or some affection of the bladder or urethra that obstructs the flow of the urine. It is often ushered in by rigors, followed by fever of an intermittent type, attended with nausea and vomiting; there is severe pain of the loin, shooting to the groin and testis and the thigh is flexed upon the pelvis. The pulse is quick, and thirst, loss of appetite, constipation or diarrhœa, are usually present. By placing one hand in front and one behind the loin a fulness or tumour can be distinguished in the renal region. The surface of the tumour in front, being covered by the colon, affords a tympanitic note on percussion, and the mass does not move with the respiration. A fulness soon presents itself in the lumbar region, followed by œdema, and the abscess, if not relieved by the surgeon, may evacuate itself either externally or into one of the neighbouring viscera. If the inflammation is the result of pyelitis the urine will contain pus, otherwise it will be free from pus and albumen (see fig. 60).

238. **C. The urine contains albumen, but no casts, and deposits blood, or is tinged with it.**

239. You must first satisfy yourself with the microscope that the colouring matter is really that of blood, as a somewhat similar colour may arise from the patient having taken beetroot, logwood, &c. In the female, blood is often found in the urine from affections of the uterus or vagina; in the male, from those of the prostate and bladder. When it comes from the bladder the blood is not generally diffused through the urine, but is chiefly passed towards the termination of micturition, and is apt to form clots. Having, then, first ascertained that there is no

disease of other organs likely to produce bleeding, and remembering that in nephritis the blood is entangled in, or accompanied by tube casts, inquire if the disease is acute (241) or chronic (244). The absence of tube casts shows that the secreting portions of the kidney are unaffected. Remember that *hæmaturia*, as the passing of blood in the urine is termed, may arise from the patient having taken irritating medicines, such as turpentine, &c.

240. The colouring matter of the blood may be present in urine when no blood-corpuscles can be detected. This may occur in jaundice, typhoid fever, and other diseases.

In certain cases the urine is coloured with blood, although no corpuscles can be detected with the microscope; you must therefore ascertain its presence by other means. The best you can employ are the guaiacum test and the spectroscope. To use the guaiacum test, place about a drachm of the suspected urine in a test-tube, add a few drops of the tincture of guaiacum and float on it some ozonic ether. A blue ring will present itself where the ether and the tincture of guaiacum are in contact, in case blood is present. Or a small portion of urine may be placed in a flat tube and examined with a microspectroscope. It should be diluted with water until the bands characteristic of the presence of blood can be distinguished—that is, one near D, with well-defined edges; the other nearer E, which is broader and less sharply marked. In some cases there is so much difficulty in determining whether the blood is the result of disease of the bladder or kidney that the cystoscope must be employed.

241. The only acute affections of the kidneys likely to produce this symptom are the passage of a stone down the ureter and paroxysmal hæmoglobinuria (248).

242. *a.* The patient suffers excruciating pain in the loin and in the course of the ureter, with numbness of the thigh and retraction of the testis; there is no fever, but usually vomiting; the urine is passed frequently, is scanty, bloody, or albuminous.

The symptoms are probably due to the *passage of a calculus down the ureter.*

The pain is not always felt in the back, but sometimes in the abdomen or sacrum. It usually ceases directly the stone reaches the bladder. The attack comes on suddenly, usually after exertion; there is often a history of pain in the back, of previous similar attacks, or the patient may have passed gravel or a calculus. The complaint is most likely to be confounded with colic, the passage of a gall-stone, or with lumbago. In colic the pain is chiefly referred to the umbilical region; it is preceded by constipation and is not attended by frequent micturition, nor is the urine bloody or albuminous. In biliary colic the pain begins below the right hypochondrium or in the epigastrium; there is tenderness on pressure over the gall-bladder, the attack is usually followed by jaundice, and the complaint is more common in the female; renal calculus is more common in the male.

243. The urine may be entirely suppressed when one ureter becomes blocked by an impacted calculus and the opposite kidney is unable to discharge its function from disease, or when both ureters are simultaneously obstructed by the pressure of a pelvic tumour. Under these circumstances, there may be only a very small amount of pale, watery urine passed, or the excretion may be entirely suspended. At first there is often an absence of all symptoms, but after a few days the patient complains of being unable to sleep, twitchings of the muscles come on, the breathing is slow and laborious, the tongue dry, and great thirst is experienced. The patient becomes feeble and drowsy, and death generally takes place within ten or eleven days.

244. The chronic diseases capable of producing hæmaturia without tube casts are rheumatic, typhoid, and other fevers, purpura, scurvy, stone in the kidney, cancer of the kidney, intermittent hæmaturia, and chyluria. I need only mention the occurrence of blood in the

urine of persons affected with fevers, purpura, and scurvy, to put the student on his guard against mistaking this symptom in such cases for one of disease of the kidney.

245. *a.* The urine is bloody and albuminous, chiefly after exertion, the patient suffers from severe pain in the back, hip, or testis; the pain varies in degree at different times, and is relieved by rest.

The disease is probably *stone in the kidney.*

Stone in the kidney may give rise to pyelitis with or without dilatation of the organ, or the calculus may escape into the bladder. The symptoms vary according to the effect it produces. Inquire if any gravel or small calculi have been previously passed; also ascertain if the urine contains crystals of lithic acid, oxalate of lime, or epithelial cells from the pelvis of the kidney. Nausea and vomiting are often present, and many patients suffer from irritability of temper or mental depression.

246. *b.* The urine frequently contains blood; the patient suffers from severe pain in the loins and is liable to attacks of vomiting: he is thin, pale, sallow, and feeble; a solid tumour can be often felt in the lumbar region.

The case is probably *cancer of the kidney.*

The disease always begins gradually, although an attack of hæmaturia is often the first symptom that arrests the attention of the patient. Inquiry will, however, show that he has suffered from nausea, vomiting, or loss of appetite for some time previously. As a rule there is no retraction of the testis.

Infants are sometimes affected by sarcoma of the kidney. The tumour is often of large size, but hæmaturia is rare. In the adult hæmaturia is the most prominent symptom, and the tumour is comparatively small. When the tumour is large it extends towards the umbilicus and downwards to the pelvis. It is partially or wholly covered by the colon, so that it may present a tympanitic note on percussion in front, or may appear to be separated into two parts by a portion of the colon crossing it.

247. The diagnosis is often difficult. If there is a tumour in the lumbar region, you have to distinguish between a malignant growth and dilated kidney. Cancer and sarcoma are much more rapid in their course, and are attended with greater loss of flesh and strength, while the temperature is subnormal: in dilated kidney the urine usually deposits pus instead of blood, and the size of the tumour often varies in proportion to the amount of pus discharged. When you suspect cancer, examine the liver in order to ascertain if it is enlarged or nodular. In the later stages of cancer you often have dropsy of the legs and abdomen, and occasionally portions of cancerous structure can be detected in the urine; but remember that the normal epithelial cells of the pelvis are not unlike some forms of cancer cells. Most of the cases of cancer of the kidney attended by hæmaturia occur in persons above fifty years of age.

248. *c.* The patient suffers from occasional attacks of hæmaturia without apparent cause; the general health is unaffected, and the urine often contains oxalates. There is no tumour in the lumbar region.

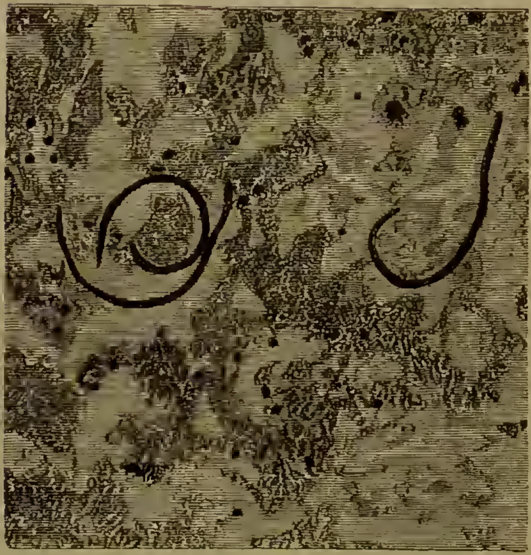
The disease is probably *paroxysmal hæmoglobinuria.*

The disease is usually ushered in by rigors or chilliness and depression of temperature, attended by pains of the back and limbs. These symptoms pass away in a few hours, and the patient regains his usual health. In most of these cases the attacks have been attributed to cold, but some seem to have been connected with gout or ague. Along with the blood there is generally a large quantity of lithic acid or oxalate of lime crystals.

The urine passed during the attack is acid, varies in specific gravity from 1010 to 1028. It is always albuminous, blood or hyaline casts may be present, but blood corpuscles often cannot be detected with the microscope. There is no enlargement of the kidneys, but in cases arising from malaria it is not unusual to find enlargement of the spleen. As a rule there is no pyrexia. There is great variety as regards the frequency with which the attacks come on: in some they may occur every other day, in others they only come on occasionally, chiefly after exposure to cold or wet. Slight jaundice is occasionally observed as the attack is passing off.

249. *d.* The urine is highly albuminous, of a milky appearance, coagulating either into a mass or forming clots, and often tinged with blood. The patient is anæmic and feeble whilst urine of this kind is being passed.

FIG. 61.



Filaria sanguinis hominis.
(S. MACKENZIE.)

The disease is *chyluria.*

When examined with the microscope white and red blood corpuscles are discovered, but no casts. The milky appearance is removed when the urine is shaken with ether, a layer of oil being left floating upon the surface.

The disease may last for many years, the urine being only occasionally milky, and the patient enjoying good health in the intervals of the attacks, or it may be continuous, the large quantity of chyle passed off in the urine gradually impairing his nutrition.

The disease originates in the tropics, and in this country is usually found in those who have resided in hot climates. It has been proved that in most cases the blood of the patient contains the embryos of a nematode worm, the parent worm being situated in one of the lymphatic vessels. From the obstruction of the lymphatics in which the worm is situated the neighbouring vessels become dilated, and if these happen to be in the vicinity of the kidneys, ureters, or bladder, the chyle finds an exit into the urinary passages. Always examine the blood drawn from the finger during the night, as the filariæ are often not to be discovered in the daytime, whilst they are readily detected from 6 P.M. to 8 A.M. The embryos (embryo filariæ sanguinis hominis) under the microscope appear to be in constant motion: they are about $\frac{1}{90}$th of an inch long and $\frac{1}{3200}$th of an inch in width, and seem to be contained in a fine sheath (see fig. 61).

Hæmaturia is a common complaint in some countries, as at the Cape of Good Hope, and there it often seems to depend on the presence of a parasite in the kidneys (see *Bilharzia Hæmatobia*).

SECTION II

YOU FIND THAT THE URINE CONTAINS SUGAR

250. There is only one disease under this head—viz., *diabetes.*

It is found that the presence of chloride of ammonium, urate of ammonium or other ammoniacal salts in the urine prevent the successful application of the copper test, if the amount of sugar is small. In any doubtful case, therefore, you should have recourse to one of the following tests:

251. Mix a small portion of German yeast with the urine contained in a test-tube, close the open end of the tube with a small dish and invert it. Pour a little more of the urine into the dish, and if any air has entered the tube mark with ink the exact height at which the liquid stands. Set aside the tube for twenty-four hours in a warm place. If sugar be present gas will be given off from the urine, and will rise to the summit of the tube.

252. The urine may be diluted with an equal quantity of a solution of carbonate of soda (1 to 3) and a little subnitrate of bismuth be added to it. After boiling for some time the bismuth will be reduced and deposited as a black powder, if sugar is present.

253. It is often necessary to determine the quantity of sugar passed during the day, in order to ascertain if the patient is improving or if the remedies he is taking are acting favourably. One hundred minims of Pavy's solution are decolorised by half a grain of grape sugar. Measure, therefore, one hundred minims of this solution into a porcelain capsule and heat it on a retort-stand until it boils. Fill a graduated pipette with the suspected urine and slowly let it drop into the contents of the capsule, which should be kept at a gentle heat and continually stirred with a glass rod. As soon as the blue colour of the copper solution is completely discharged, you note the quantity of urine that has been required, and reckon the amount of sugar contained in each ounce. Multiply this by the entire quantity passed in the twenty-four hours, and you will obtain the daily amount excreted. It is better to take your specimen of urine from all that has been passed in twenty-four hours, as the percentage of sugar varies greatly at different times of the day. In most cases the urine will be found to contain too much sugar for accurate testing, so that it is better to dilute it so that it will only form a tenth of the fluid in the burette. Of course you must remember to multiply the amount by ten in your calculation.

254. *a.* The urine contains sugar, it is pale, of a straw colour, of high specific gravity (1030–1050), has a faint smell, and is passed in large quantities. The patient has lost flesh and strength, complains of great thirst and sinking at the stomach; he has a dry, harsh skin, pains in the back and limbs; the appetite is voracious, and the bowels are usually confined.

The disease is *diabetes mellitus.*

You must examine the urine more than once, with an interval between the examinations, because the presence of the sugar may be only temporary; thus, a small quantity may result from some improper article of diet, and is occasionally observed in cases of disease of the heart and lungs. Never give an opinion as to the disease without satisfying yourself by careful examination that sugar is present; for there is an excessive quantity of urine secreted in diabetes insipidus, in chronic intertubular nephritis, in hysteria, and other disorders.

The quantity of urine passed daily in diabetes varies from 8 to 30 pints, or even more; from 1 to 2½ pounds of sugar may be thus discharged in the twenty-four hours. The disease comes on gradually, and the patient often complains of thirst, weakness, and loss of flesh before he observes the increase in the amount of urine. The breath has almost always a sweet, ethereal odour, and the irritation set up by the sugar frequently produces inflammation of the glans penis in the male, and of the vulva in the female. The knee jerks are usually absent.

Cases of diabetes vary greatly as regards their duration. Some run a rapid course, whilst others may continue for many years. When sugar appears only occasionally and the patient presents no marked loss of flesh, thirst, or excessive secretion of urine, the disease is generally termed *glycosuria.* It chiefly affects persons advanced in life, those who are very stout, and those liable to gout or chronic rheumatism. In such cases the sugar may quite disappear, or may alternate with deposits of uric acid or of urates; or, on the other hand, it may gradually increase in amount, and the ordinary symptoms of diabetes may develop themselves.

Death often results from phthisis, probably produced by imperfect nutrition. In other instances, it takes place suddenly from failure of the heart, generally after the patient has been subjected to unusual mental or bodily excitement. Still more generally the disease ends in coma. Under such circumstances, the amount of urine or of sugar excreted becomes rather suddenly reduced, and the patient is attacked with pain in the abdomen with or without vomiting, the temperature is subnormal, the breathing slow, deep, and sighing, the pulse is rapid and feeble, the patient exceedingly restless and uneasy, and he gradually sinks into a state of insensibility, ending in death.

255. *Diabetes insipidus* is characterised by the passing of a large quantity of clear, colourless urine, of low specific gravity (1003 to 1007), devoid of sugar and albumen. The complaint is usually attended with thirst, dry, harsh skin, and feebleness of body and mind. The amount of urine passed may be very great (20 to 30 pints in the twenty-four hours), and the quantity of the solid contents may be less, but it usually exceeds the normal excretion. In some cases the complaint persists for many years without any deterioration of the general health.

SECTION III

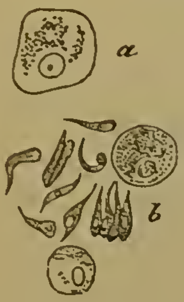
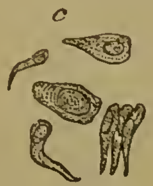
YOU FIND A DEPOSIT IN THE URINE

256. Observe whether the urine you placed in the conical glass remains clear or has deposited a sediment. If there is a deposit, pass a piece of glass tube, the upper end of which is closed by your fore-finger, to the bottom of the glass, raise the finger for a moment so as to allow a small quantity of the deposit to rise in the tube, close again the end of the tube, and place a drop of the deposit, thus obtained, on a clean glass slide, or shallow glass cell, cover it with a piece of thin glass and examine it with the microscope. A $\frac{1}{2}$- or $\frac{1}{4}$-inch objective is best fitted for the purpose. When you wish to ascertain the effects of re-agents on the deposit, place a drop near the covering glass and watch the result.

257. In perfectly healthy urine you may have a slight cloudy deposit of mucus, and on examining this with the

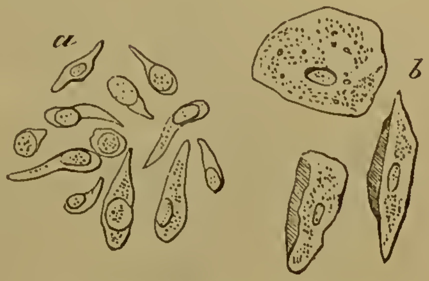
microscope, you will usually find epithelial cells from the bladder and urethra. Those from the general surface of the bladder are flat and scaly, from the urethra columnar. (see figs. 62 and 63).

FIG. 62.

a. Epithelial cells from the upper surface of the bladder. *b.* From the fundus of the bladder. *c.* From the ureter. (BEALE.)

FIG. 63.

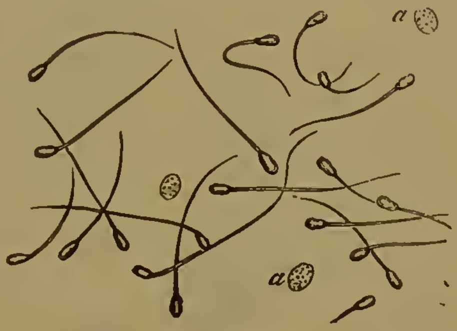


a. Epithelium from the urethra. *b.* Vaginal epithelium. (BEALE.)

In diseases of the kidneys you often find a quantity of epithelium from the renal tubes. These cells are small, round, or polygonal, and have a well-defined nucleus. The epithelial cells from the ureters and pelvis of the kidney are of the columnar form, and often adhere together in small pieces (fig. 62).

258. In some cases spermatozoa are present. They are oval in form, with long delicate tails, and require a $\frac{1}{4}$-inch objective for their detection. It is only when numerous and constantly passed that they can be looked upon as indicating disease (see fig. 64).

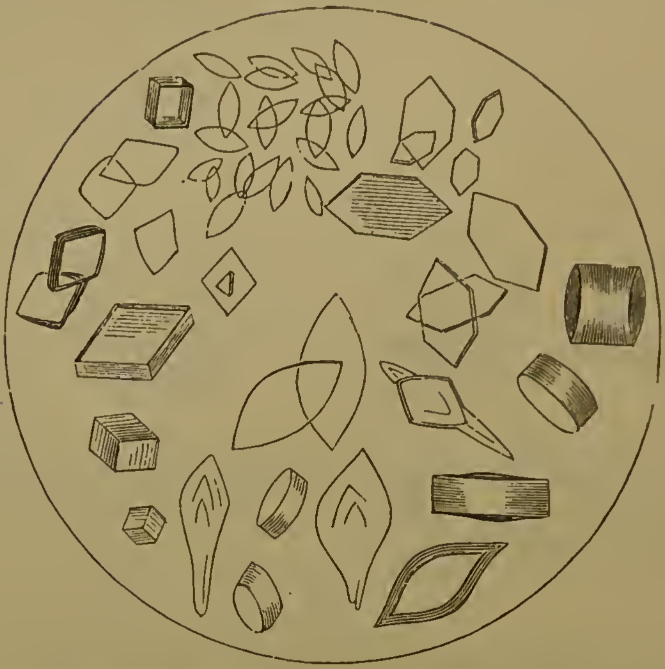
FIG. 64.



Spermatozoa and spermatic granules, magnified 400 diameters.

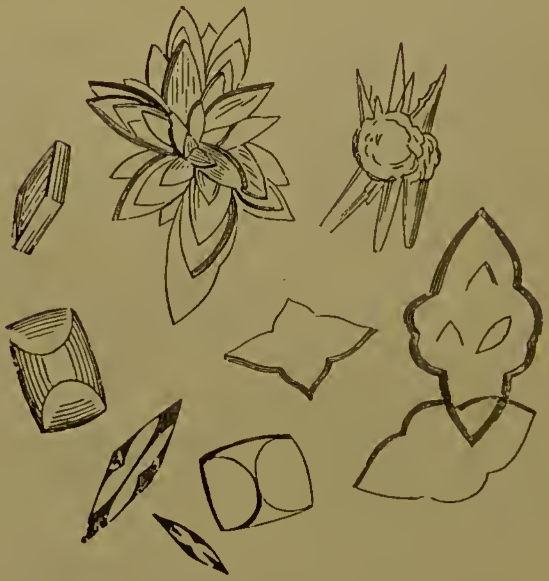
In examining a urinary deposit, observe whether it is

FIG. 65.



The simpler forms of uric acid crystals. (ROBERTS.)

FIG. 66.



Rarer forms of uric acid crystals. (ROBERTS.)

composed chiefly of crystals, or is granular and amorphous. If crystalline, begin at (259); if amorphous, pass on to (265).

259. **A. The deposit consists of crystals.**

The crystals generally met with are those of uric acid, oxalate of lime, triple phosphate, and cystine.

260. *a.* The deposit is red, and in grains not unlike cayenne pepper. Under the microscope the crystals are reddish or yellow rhombic plates, or like lozenges (see figs. 65 and 66).

They consist of *uric acid* (*lithic acid*).

In case of doubt, add a drop or two of nitric acid to a little of the deposit placed upon a glass slide; dry it over a spirit lamp, and add to it when cold a drop of ammonia or liquor potassæ; if it is composed of lithic acid, a beautiful purple colour will be produced.

This deposit does not, except when in large quantity, necessarily indicate an *excess* of uric acid, for it is thrown down in any normal urine, when an acid is added to it. When the amount is large and constant, it is associated with an increased acidity of the urine; it is therefore present in a number of different disorders, such as indigestion, rheumatism, gout, fevers, &c. If the deposit occurs *directly* after the urine is passed, you may suspect a tendency to the formation of uric acid calculi in the kidney.

261. Urate of sodium is occasionally deposited in a crystalline form in the febrile diseases of childhood. The crystals present spines which may be either straight or curved (see fig. 67).

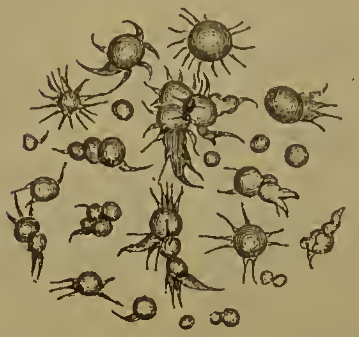
Urate of ammonium sometimes appears as globular masses, or in the shape of minute and slender dumb-bells (see fig. 68).

262. *b.* Microscopically, the crystals are octohedral (like envelopes), or dumb-bell shaped, and of various sizes.

They are composed of *oxalate of lime* (figs. 69 and 70).

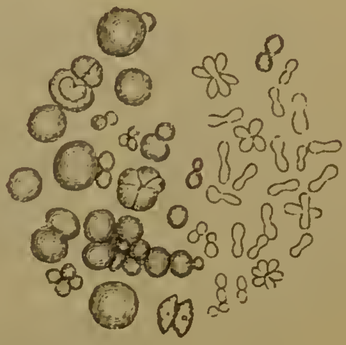
This deposit is usually scanty, and looks to the naked eye like mucus. The crystals are insoluble in acetic acid and liquor potassæ, but dissolve in dilute nitric acid. It is very common to find oxalate of lime crystals in small numbers in the urine of healthy persons, and a deposit of them may be produced by certain articles of food, such as rhubarb. When numerous and persistent, they generally indicate irritability of the nervous system and feeble digestion.

FIG. 67.



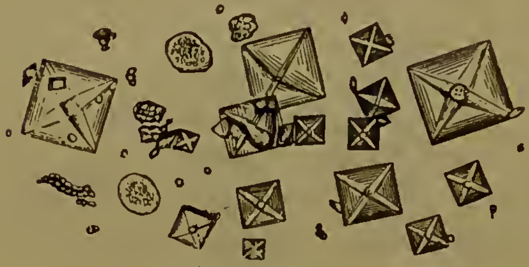
Hedgehog crystals of urate of sodium spontaneously deposited from the urine of a child. (ROBERTS.)

FIG. 68.



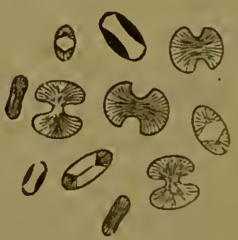
Urate of ammonium in the crystalline form. Spheres and globular deposits. Dumb-bells, crosses, rosettes. (ROBERTS.)

FIG. 69.



Octohedral oxalate of lime crystals.

FIG. 70.



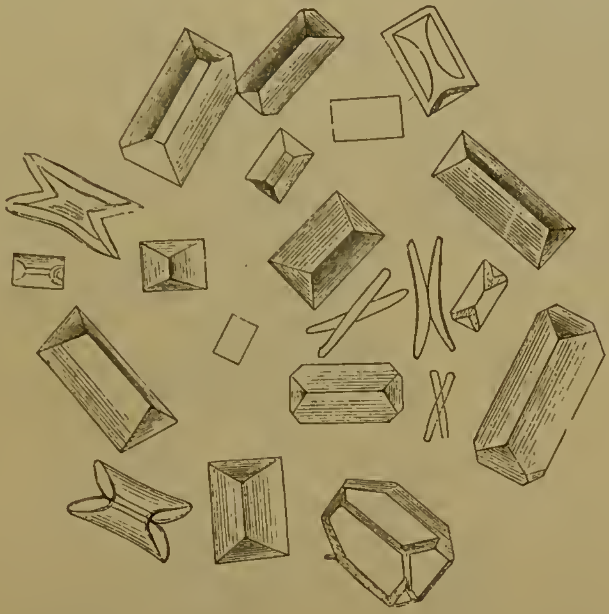
Dumb-bell shaped crystals of oxalate of lime.

263. *c.* The crystals are in the form of transparent prisms or feathery bodies (figs. 71 and 72).

They are composed of *triple phosphate.*

These crystals are soluble in acetic acid. They are associated with a neutral or alkaline state of the urine, and may be produced by the decomposition of the urine set up by the mucus secreted by a diseased bladder. When there is no local cause for their production, they generally indicate a feeble state of the sytem.

FIG. 71.

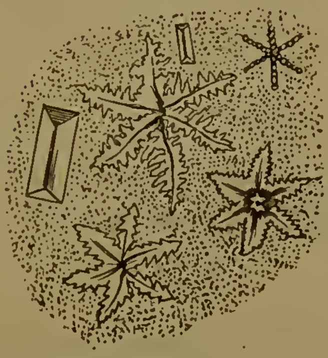


Different forms of triple phosphate crystals. (ROBERTS.)

264. *d.* The crystals are six-sided plates, very sparingly soluble in hot water, but readily so in ammonia, and are deposited unchanged upon the spontaneous evaporation of the solution (fig. 73).

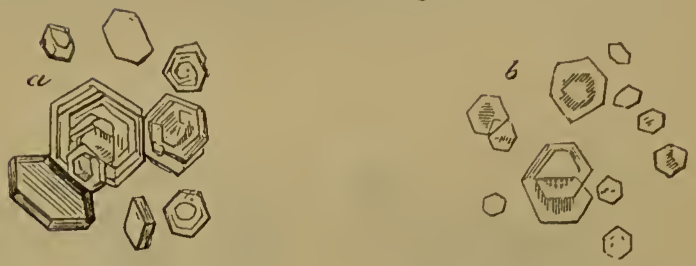
They are composed of *cystine.*

FIG. 72



Feathery forms of triple phosphate crystals.

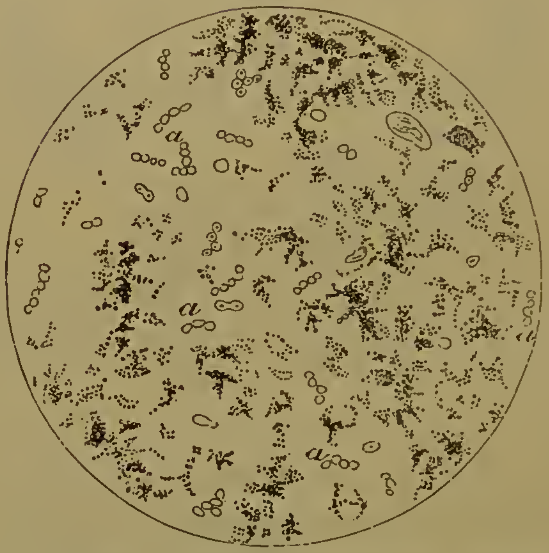
FIG. 73.



a. Crystals of cystine.

b. Six-sided crystals of cystine formed from a solution of the crystals in ammonia. (BEALE.)

FIG. 74.



Microscopic appearance of amorphous urinary sediment, consisting of urate of soda. *a.* A few fermentation fungi intermixed with it. (NEUBAUER and VOGEL.)

The ammonia is used to distinguish cystine from lithic acid, the latter being deposited in a *granular* form from its solution in ammonia.

265. **B. The deposit is amorphous.**

The substances likely to form this deposit are pus, urate of sodium or ammonium, and earthy phosphates. Add to the deposit in a test-tube half its bulk of liquor potassæ, and shake it briskly.

266. *a.* *Pus* is distinguished by the microscope (fig. 57), and forms a glairy mass when shaken with liquor potassæ.

267. *b.* The deposit dissolves in liquor potassæ. It is formed of *urate of sodium*, *ammonium*, or *lime*.

The urates are the most common of all the urinary deposits, and are of very slight clinical importance. They indicate that the urine is acid and concentrated, and they are most readily deposited in cold and damp weather (see fig. 74).

268. *c.* The deposit does not dissolve in liquor potassæ.

It is formed of *earthy phosphates*.

CHAPTER VII

DISEASES OF THE LIVER

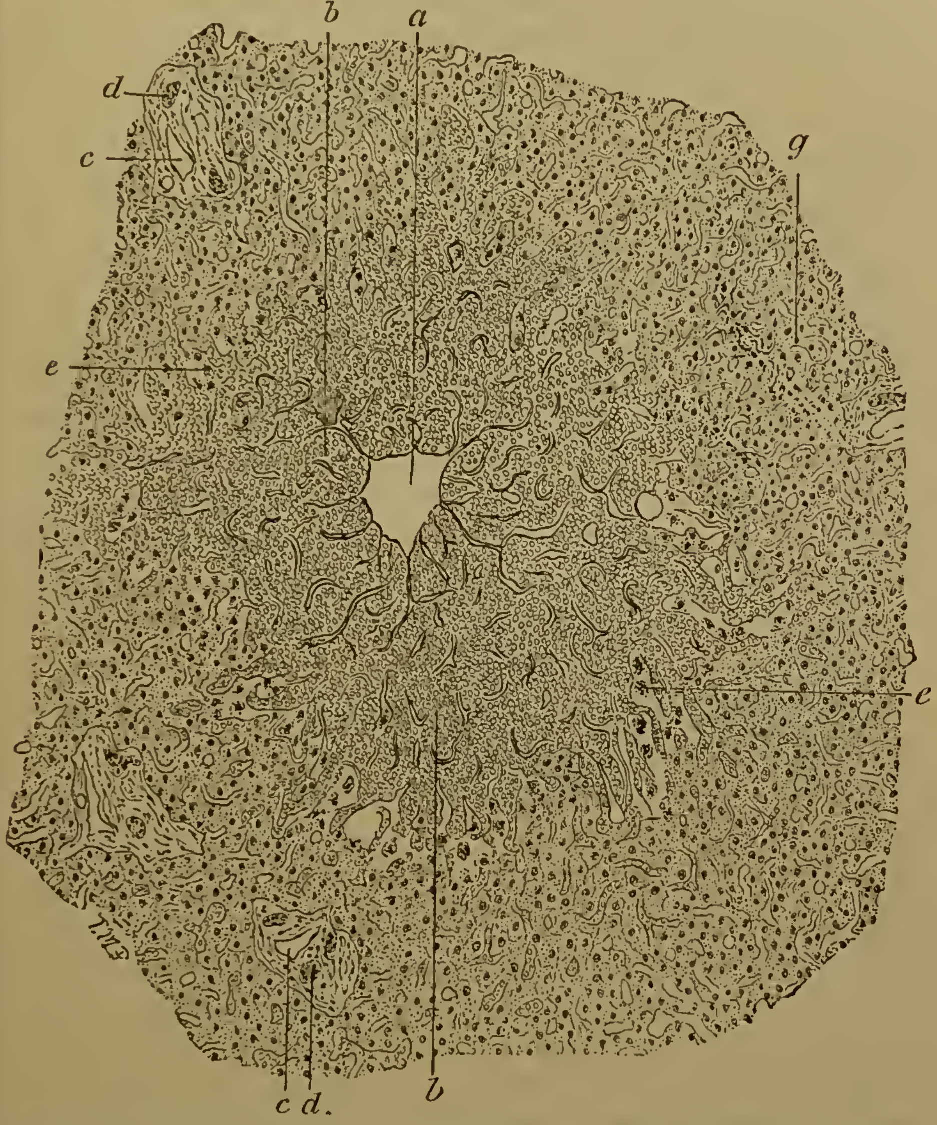
THE principal diseases to which this organ is liable are—congestion, suppurative hepatitis, acute atrophy, cirrhosis, fatty and lardaceous degenerations, hydatid and cancerous tumours. In addition to these we have to consider the diseases of the gall-bladder and biliary calculi.

269. CONGESTION OF THE LIVER.—*Passive* congestion of the liver occurs in valvular disease, in dilatation of the heart, and in emphysema and other diseases of the lungs which obstruct the flow of blood through the right side of the heart. *Active* congestion of the organ is usually the result of intermittent fever, or of immoderate eating or drinking. When *passive* congestion has been maintained for some time the so-called "nutmeg liver" is produced. In this condition the liver is considerably enlarged, smooth on the surface, of a dark red or violet colour, while its anterior margin is hard and prominent. When cut a quantity of blood exudes, and the section presents the appearance of a nutmeg—viz., numerous red spots or patches, surrounded by zones of a yellowish or dirty-white colour. Microscopically, the central vein in each lobule is found to be much dilated, and from it a number of distended capillaries radiate in all directions through the lobule. The pressure of these dilated vessels causes atrophy of the hepatic cells in their immediate neighbourhood. The central vein is often surrounded by a quantity of granular material and blood pigment, while the cells at the periphery of the lobule are filled with fat

globules. In long-standing cases new connective tissue may form between the lobules (*red atrophy*) (see fig. 75).

270. Acute Suppurative Hepatitis is rare in temperate

Fig. 75.



Chronic congestion of liver.—*a.* Dilated central vein. *b.* Dilated capillaries. *c.* Portal vein surrounded by connective tissue. *d.* Gall-duct. *e.* Atrophied liver cells. *g.* Liver tissue. (Delafield and Prudden.)

climates, but is not uncommon in tropical regions. The only stage in which you are likely to meet with it is abscess. Abscess usually presents itself in this country either in connection with disease of the colon, or as the result of pyæmia. In the former case the abscess is usually single and of large size, and the pus may be surrounded by an uneven, ragged boundary of softened hepatic tissue, or it may be enclosed by a thick, tough membrane. When it results from pyæmia, a number of small abscesses occur in the course of the portal vein. A hepatic abscess, when single, generally presents itself in the right lobe. It may point externally, or may burst into the peritoneum, into the chest, or into some part of the intestinal canal; or more rarely the pus may dry up, and leave a cheesy mass of white, dry matter.

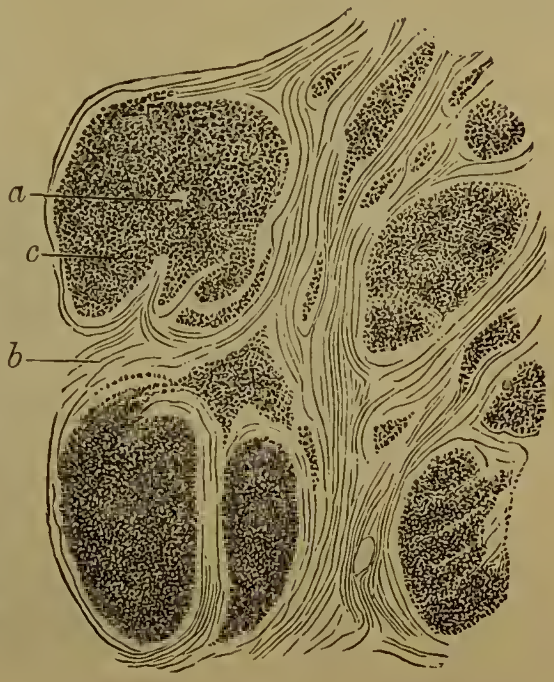
271. THICKENING OF THE CAPSULE OF THE LIVER (PERIHEPATITIS) is the result of inflammation, and is usually accompanied by adhesion of the organ to the diaphragm, stomach and colon. It may occur along with chronic peritonitis or pleurisy, or it may result from the irritation set up by an abscess of the liver, or from syphilitic disease or cirrhosis. In many cases the capsule is greatly thickened by newly formed fibrous tissue, which, by its contraction, causes great deformity of the organ and atrophy of its structure.

272. IN ACUTE ATROPHY the liver is much reduced in size, it is of a greenish-yellow colour, and is soft and flaccid in its texture. Microscopically, the lobules cannot be distinguished from one another; at certain spots the hepatic cells have vanished, and are replaced by a confused mass of pigment, granular matter and oil globules. In the early stage of the disease there appears to be an exudation of leucocytes around the branches of the hepatic artery. The spleen is usually enlarged. Crystals of tyrosine and leucine are found both in the liver and the urine, and sometimes in the blood of the hepatic veins (see figs. 82 and 83). The cause of this disease is unknown, but most pathologists look upon it as a result of some morbid material in the blood.

273. CIRRHOSIS OR CHRONIC INTERSTITIAL HEPATITIS is a form of chronic inflammation of the liver in which the connective tissue between the lobules becomes enormously

increased and atrophy of the secreting structure is produced. The liver is irregular on the surface, being usually covered with protuberances of various sizes (" *hob-nail liver*"). It is of a light yellow colour, hard, tough and leathery; and is much reduced in size, especially the left lobe, which is often shrivelled to a mere membranous appendage; the capsule is opaque and closely adherent. Microscopically, the main portion of the structure is formed of connective tissue produced by inflammation around the branches of the portal vein. By the shrinking of this new-formed tissue the lobules are compressed and the liver cells become fatty, or are absorbed and disappear. The branches of the hepatic artery are often enlarged, and ramify in the thickened structure, but the ramifications of the portal vein are compressed and in many cases obliterated. The protuberances on the surface are formed of groups of lobules isolated and constricted by the new-formed connective tissue (see fig. 76).

FIG. 76.



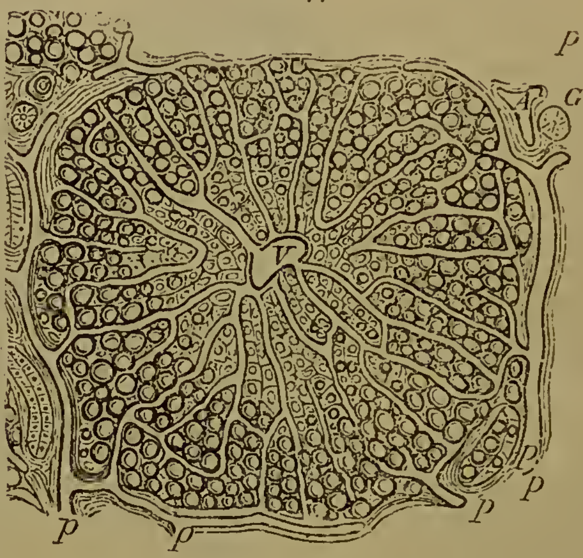
$\frac{25}{1}$

Atrophic cirrhosis of liver.—*a*. Central vein. *b*. Interlobular fibrous tissue. *c*. hepatic lobule. (CORNIL and RANVIER.)

In the early stage of the disease the liver is usually enlarged; it is also enlarged when cirrhosis is combined with fatty or lardaceous degeneration. From the compression exercised on the branches of the vena portæ in the liver the whole of the blood-vessels of the portal system become overloaded with blood. Hence serum exudes into the cavity of the peritoneum, causing dropsy (ascites), the spleen is generally increased in size, and the mucous membrane of the stomach and bowels is so congested that severe hæmorrhages often take place.

274. HYPERTROPHIC CIRRHOSIS.—The organ is much enlarged and is dense and hard. Microscopically, the disease appears to originate in chronic inflammation around the smaller biliary ducts situated in the lobules. Consequently obstruction of these ducts takes place, producing jaundice, whilst the obstruction to the portal circulation, and the resulting ascites so common in ordinary cirrhosis, are usually absent.

FIG. 77.



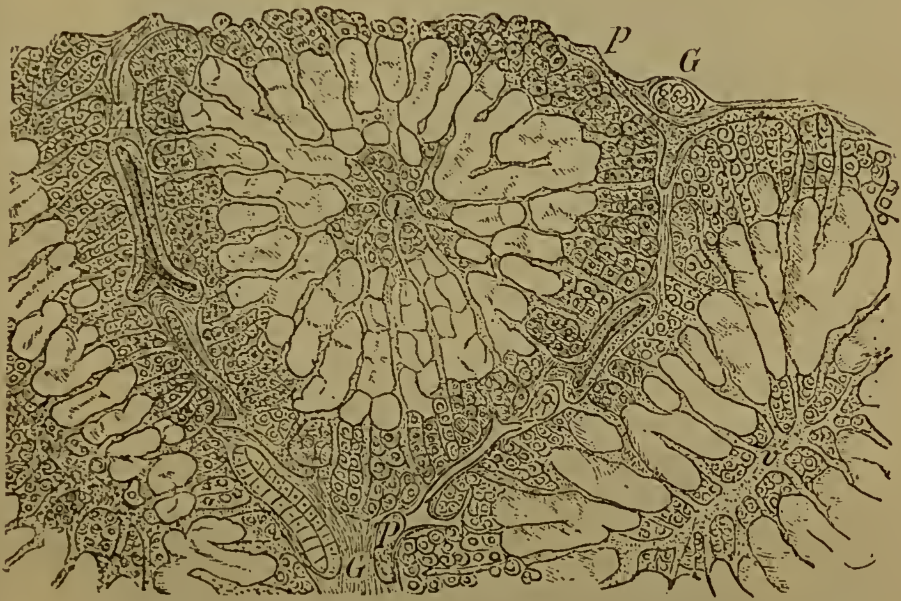
Fatty liver. *V.* Intralobular veins. *p. p.* Interlobular branches of portal vein. *A.* Arteries. *G.* Bile ducts. (RINDFLEISCH.)

275. THE FATTY LIVER is uniformly enlarged, has round edges, feels greasy, is pale in colour, and soft in texture. Microscopically, the hepatic cells are filled with oil, and their nuclei are obscured or have disappeared. In the earliest stage, the cells in the exterior of the lobules, where the

ramifications of the portal vein are distributed, are alone affected, but as the disease progresses the morbid change spreads also to the centres of the lobules (fig. 77).

The disease is generally found in connection with phthisis, or some other wasting disorder. It is supposed that the fat is absorbed from the tissues of the body, which are rapidly undergoing disintegration, and is deposited in the cells of the liver. Fatty degeneration of the liver cells also occurs in severe anæmia and as a result of phosphorus poisoning.

FIG. 78.



Lardaceous liver. *A*. Interlobular artery with amyloid walls. *G. G.* Bile ducts. *P. P.* Portal veins. *v. v.* Intralobular veins. The liver cells in the middle zone of each lobule are infiltrated with amyloid matter. (RINDFLEISCH.)

276. LARDACEOUS OR AMYLOID LIVER.—The whole organ is uniformly enlarged; it is very heavy, firm, smooth, and pale on the surface. A section is dry and bloodless, and has a translucent, waxy appearance. A solution of iodine gives a reddish-brown colour to the tissue. Microscopically, the walls of the capillaries in the middle zone of the lobule

appear thick and translucent, and the cells of the liver are pressed upon and atrophied by their pressure. In advanced cases the cells are greatly destroyed and the secreting structure is replaced by amyloid material, which stains rose pink with methyl-violet (fig. 78). The disease is sometimes associated with fatty degeneration, and generally occurs, along with a similar condition of the spleen and kidneys, in persons who have suffered from long-continued suppuration, from phthisis, or from syphilis.

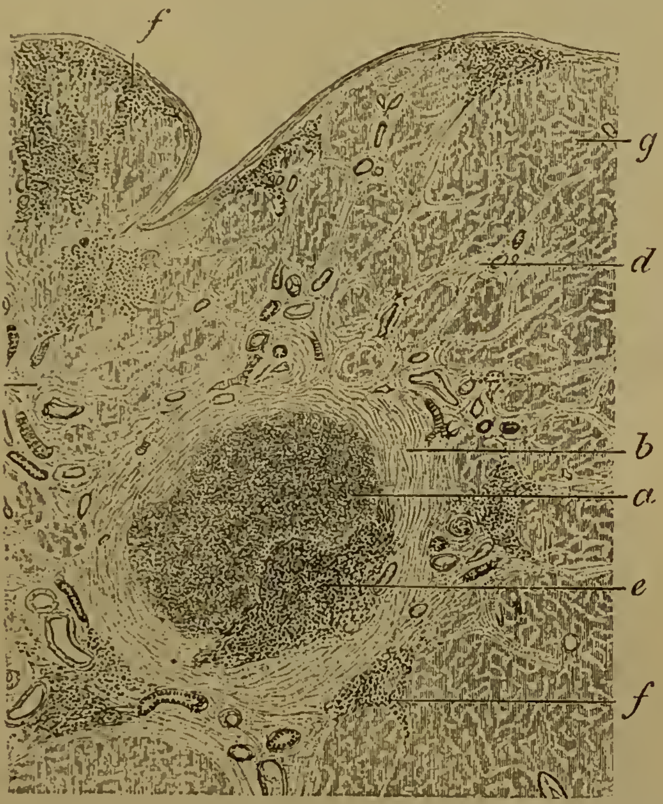
277. SYPHILIS usually affects the liver in the form of gummata. The surface of the organ is irregularly indented owing to the contraction of localised patches of fibrous tissue. On section these fibrotic areas are found to contain caseous masses which vary from the size of a pea to that of a small egg (fig. 79). In severe cases a considerable amount of cirrhosis is present and the liver appears to be cut up into a number of small lobes. In infants affected with congenital syphilis the liver is sometimes the seat of a diffuse cirrhosis, the fibrous tissue being interspered with small gummata.

278. TUBERCLE occurs in the liver in the form of small grey granulations in cases of acute miliary tuberculosis. In rare instances small caseous masses or tubercular abscesses are encountered as the result of tubercular disease of the bile ducts.

279. TUMOURS.—*Primary cancer* of the liver is a rare disease. In cases of diffuse cancer the organ is greatly enlarged, heavy, and slightly granular on section. The connective tissue between the lobules is increased, and the liver structure is replaced by cancer cells. *Secondary cancer* usually results from disease of the stomach, intestine, uterus, or breast. It occurs in the form of isolated tumours situated in the substance of the organ, the microscopical appearances of which are similar to those of the primary disease. *Scirrhous tumours* often contract in the centre and produce cupping of the surface. *Sarcoma* of the liver is very rare.

280. PARASITES.—*Hydatid cysts* occur more frequently in the liver than in any other organ, and often attain an enormous size. The usual seat of a cyst is in the right lobe. The whole liver appears enlarged; the increase in size is not uniform, however, but is greatest near the part affected. The structure of the organ is healthy. The outer wall of the cyst is composed of condensed liver tissue, but the inner wall consists of a delicate laminated membrane. The cyst contains a quantity of clear fluid, and usually other smaller cysts which vary greatly in size and float in the liquid. Attached to and growing from the lining membrane are minute bodies, which, on microscopic examination,

FIG. 79.

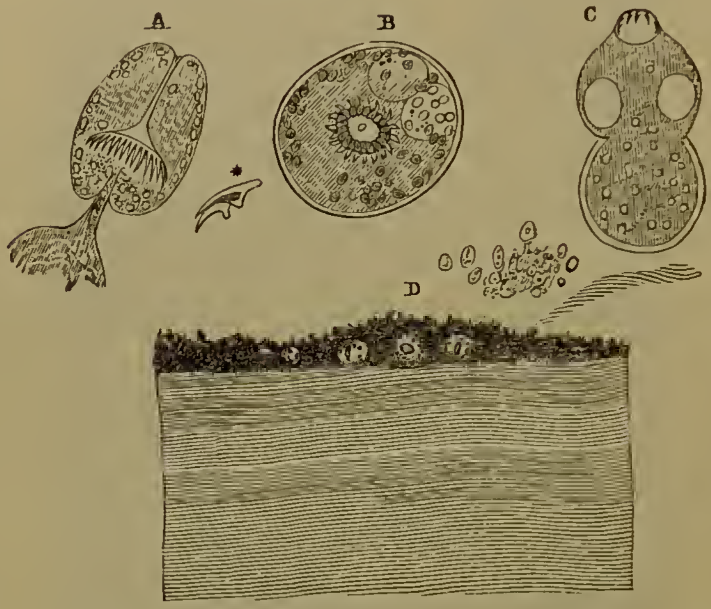


Gumma of liver.—*a.* Caseous centre. *b.* Zone of fibrous tissue. *d.* Ramifying bands of fibrous tissue. *f.* Small round cells. *g.* Normal liver tissue. (ZIEGLER.)

are seen to be oval in shape, and to possess a head surrounded by a crown of minute hooks (fig. 80).

In some cases the hydatid dies and is converted into a putty-like mass, which you can distinguish from the remains of an abscess by finding amongst its contents the hooklets of the "echinococci," as these minute animals are named. Sometimes the cyst bursts into the colon or through the diaphragm into the pleural cavity; in other cases its contents become converted into pus and an abscess of the liver results. Hydatid cysts are developed from the ova of a tapeworm (see *Tænia echinococcus*), which probably enter the veins from the intestines and thus find their way to the liver.

FIG. 80.



A. Echinococcus, the head retracted. B. Echinococcus, the head and coronet of hooks facing the observer. C. Echinococcus, the head extruded. D. Section of wall of the cyst, in the lining membrane of which are seen several echinococci.

281. The Gall-ducts and Gall-bladder are liable to inflammation and malignant disease, and thus we meet with

thickening, ulceration, stricture, and other morbid changes in them. If the passage of the bile has been obstructed, the gall-bladder becomes distended and may attain a considerable size. *Gall-stones* are often found in the gall-bladder after death; they are chiefly composed of cholesterin (usually 80 to 90 per cent.), bile-pigment, and earthy matters. They vary in size from a hempseed to a hen's egg; when only one exists in the gall-bladder it is round or oval, but when there are many they usually present smooth, flat surfaces, from their friction on each other.

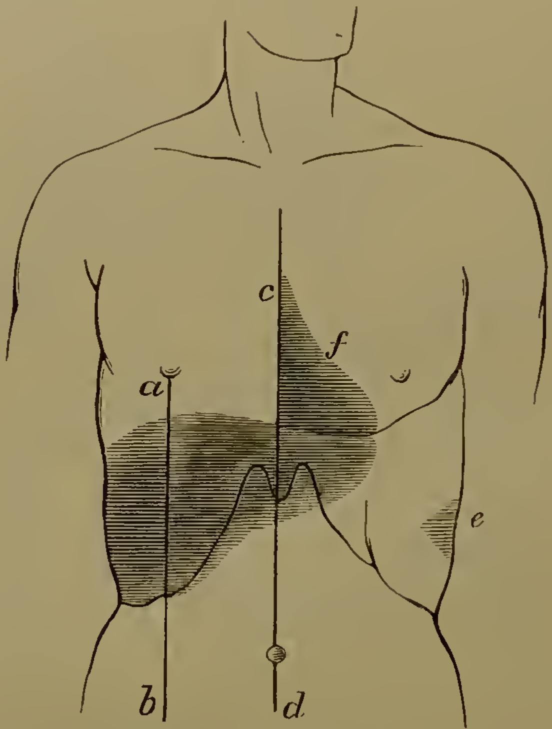
The presence of a gall-stone tends to inflame the gall-bladder, which sometimes suppurates. If the calculus finds an entrance into the cystic duct, it excites spasm (biliary colic); and if it becomes impacted in the common bile-duct jaundice results. The stone may ulcerate into the duodenum, and if it be of large size may block the ileo-cæcal valve, and produce intestinal obstruction. Cancer of the gall-bladder is apt to ensue from the irritation of a stone.

The symptoms that should lead you to suspect an affection of the liver are—pain, or a feeling of weight, in the epigastrium, right side or shoulder, pale-coloured stools, jaundice, vomiting, flatulence, dropsy of the legs or abdomen, or hæmorrhage from the stomach or bowels. You should also always examine the state of this organ in cases of disease of the heart and kidneys.

282. You ascertain the size and shape of the liver by percussion, auscultatory-percussion, and by palpation. Trace the upper border first, and mark the outline with ink or a pencil; beginning to percuss where the sound is clear, and continuing downwards until you bring out a dull note. You will remark that before you find the sound *quite dull* there is a portion where, from the upper edge of the liver being covered by a thin layer of lung, the sound is a little more resonant than that just below it.

Both borders of the liver are curved; the upper partially dull line extends from the tenth or eleventh dorsal vertebra behind to the seventh intercostal space on a line with the centre of the axilla, and to the fifth intercostal space on a line with the right nipple, from which the dulness is prolonged to the apex of the heart. The lower border corresponds, below the right nipple, with the lower margin of the ribs; in the epigastrium it generally extends two or three inches below the junction of the sternum with the lowest

FIG. 81.



Area of hepatic dulness, viewed anteriorly. *a—b.* Right mammary line. *c—d.* Median line. *e.* Splenic dulness. *f.* Cardiac dulness. (MURCHISON.)

costal cartilage (see fig. 81). To define the upper border percuss strongly; at the lower press the finger or pleximeter firmly down and strike lightly. You will often find auscultatory-percussion of great use in defining the lower border. Whenever the liver is diseased, ascertain also the dimensions of the spleen.

283. You will gain valuable information by feeling the liver when it is enlarged. Place the patient on the left side, with both knees bent and the back supported by a pillow. Slide the tips of your fingers or the edge of your hand from below upwards beneath the lower edge of the liver, and instruct him to draw a full breath. In this way you will often be able to examine both the inner and outer surfaces of the organ, and to detect any projections or irregularities that may be present. In other cases it is better to let him rest on his elbows and knees, whilst you sit or stand behind. Place one hand behind and the other in front of the right hypochondrium, and you will often, whilst he draws a full breath, be able to ascertain an enlargement that you cannot distinguish when he lies upon his back.

284. Jaundice often accompanies disease of the liver, and is produced by the presence of bile-pigment in the blood. The yellowness is seen in the skin, conjunctivæ, and urine. In some diseases, as in chlorosis, pernicious anæmia and malignant growths, the colour of the skin simulates jaundice, but in the latter alone the conjunctivæ have a yellow tinge. As the urine may be coloured yellow by other substances, you should test for the presence of bile with nitric acid. Pour a little of the urine on a white plate, and drop into it a small quantity of nitric acid; if bile-pigment is present a play of colours will appear round the acid—green, blue. violet, red and yellow; or the same play of colours may be obtained by floating a little of the urine upon a small quantity of nitric acid contained in a test tube.

285. Whenever there is an obstruction to the flow of the blood through the portal system, whether it be in the liver itself or in the veins external to it, effusion of serum into the peritoneum is produced (*ascites*). In the earlier stages it is often difficult to detect the presence of the fluid, but as it always gravitates to the most dependent parts of the cavity, you will find dulness on percussion in the flanks and hypogastrium when the patient lies upon his back. Let him first rest upon one side and mark out the line of

dulness on that side; then when he turns to the opposite side, the part that was previously dull will now afford a tympanitic note from the displacement of the fluid. When the effusion is sufficient to fill the abdomen, you will observe that it is equally distended on both sides, and that there is a general dulness on percussion, excepting in the umbilical region over the colon. The line of dulness in this region, however, varies with the position of the patient. When the fingers of one hand are applied to one side of the abdomen and a sharp tap is given to the opposite side, a wave of fluctuation can be distinguished.

The diseases of the liver most apt to produce ascites are cirrhosis and cancer, but it may also present itself in lardaceous liver and occasionally in hydatid tumour.

First inquire if the disease has begun suddenly or gradually. If suddenly, begin at (286); if the appearance of the symptoms has been gradual, pass on to (296).

SECTION I

The Disease has commenced Suddenly

286. Under this head you have acute congestion, abscess of the liver, jaundice arising from obstruction of the common gall-duct, acute atrophy of the liver, and perihepatitis. In the three first the area of hepatic dulness is increased; in acute atrophy it is diminished.

A. The liver is increased in size.

287. *a.* You find the liver increased in size, a little tender, and smooth on its surface. There is pain or weight in the right side, pain in the right shoulder, slight jaundice, headache, nausea or vomiting, the tongue is foul, there is loss of appetite, and the bowels are usually confined. There is little or no fever.

The disease is *acute congestion of the liver.*

Congestion of the liver is usually of a chronic character, but occasionally it begins suddenly, either as the result of an injury, of alcoholic excesses, or when dilatation of the heart occurs as an acute affection. The urine is high coloured, deposits lithates, or is tinged with bile. When the jaundice is slight, the stools may be normal in appearance. Always examine the lungs when you meet with an acute attack of slight jaundice, attended with some enlargement of the liver and fever, as hepatic congestion is occasionally the result of acute lobar pneumonia of the right lung.

288. *b.* In addition to the signs of acute congestion, you find considerable pain and tenderness on pressure over the liver, vomiting, often urgent, shiverings, profuse sweats during sleep, thirst, quick pulse and emaciation. Sometimes delirium is present.

The disease is probably *abscess of the liver.*

Abscess of the liver occurs either as the result of acute inflammation, or as the consequence of pyæmia, in the latter condition there are generally numerous deposits of pus. The *former* is rarely met with in this country, excepting in those who have lived in the tropics and have suffered from dysentery.

In the *pyæmic form* the symptoms are usually those of the general affection, and there may be a complete absence of any indications of hepatic disease. Jaundice is often present, but this again may be the result of pyæmia alone. There is rarely any marked enlargement of the liver or tenderness on pressure, and in the absence of these it will be impossible for you to diagnose the complaint. The pyæmic form usually results from external injuries and surgical operations, or from some internal abscess or ulceration. It may arise from ulcers of the stomach, intestines, vermiform appendix, or disease of the pancreas, or from suppuration in or near the gall-bladder.

When the abscess is of large size (*single or tropical abscess*) it is usually ushered in by rigors, followed by an elevated temperature and quick pulse. There are pain or uneasiness, with tenderness on pressure in the right hypochondrium, often pain of the shoulder, nausea, and in many cases uncontrollable vomiting; the tongue is foul, afterwards dry and glazed, the bowels are confined or relaxed, the urine scanty and high coloured. As the case progresses the rigors recur frequently, the temperature assumes a hectic type, there are frequent sweatings, the patient rapidly loses flesh and strength. Jaundice is rare. The liver can be generally shown to be enlarged by palpation and percussion. If the abscess points towards the lower border, you will find a round, painful tumour in the epigastrium or right hypochondrium, and as suppuration proceeds the skin over it becomes red and œdematous, and a feeling of elasticity or fluctuation can be discovered. If it tends towards the diaphragm there may be a bulging in one or more of the intercostal spaces, or, what is more usual, there is dulness on percussion, with feeble respiration at the base of the right lung. The pus may be evacuated externally, or the abscess may burst into the lung or right pleura, into some part of the gastro-intestinal tract, or more rarely into the peritoneum. In all cases of difficulty you must use an aspirating needle. When the abscess has burst into the lung, the expectoration is sometimes of a reddish-brown colour, and when examined by the microscope, the *amœbæ coli* have been found in it. Dr. Osler describes them as "being present in variable numbers and displaying active amœbic movements."

289. You may confound hepatic abscess with abscess of the abdominal walls, suppuration of the gall-bladder, or an hydatid cyst. Hepatic abscess is most common in those who have lived in the tropics and suffered from dysentery, whilst abscess of the abdominal walls is usually the result of an injury. In the latter there is much less pain and fever, the rigors and sweatings are less pronounced, emaciation does not proceed so rapidly, and percussion in the hepatic region behind does not show any increase in the size of the

liver. Abscess of the gall-bladder is usually associated with a history of attacks of biliary colic, it is accompanied by jaundice, the tumour is smaller and better defined than that of hepatic abscess. An hydatid cyst, unless it is in a state of suppuration, is not infrequent in the female, in whom hepatic abscess is very rare. There is an absence of rigors, fever and emaciation; there is no pain, and the tumour is movable, elastic, and not tender on pressure. When suppuration occurs in it, it is, of course, practically an abscess, and can be distinguished only by the history of the case.

290. *c.* You find yellowness of the skin and conjunctivæ, the urine is yellow or like porter, and often deposits a thick sediment, the stools are pale, the heat of skin is not increased, the pulse is slow, and there are no head symptoms; there is increased dulness over the site of the gall-bladder.

The disease is *jaundice from obstruction of the common gall-duct.*

Acute jaundice usually results from an obstruction to the entrance of bile into the duodenum and its consequent absorption into the circulation, but it also presents itself in certain febrile conditions where there is no hindrance to the exit of the bile into the intestinal canal.

Obstruction occurs whenever the hepatic or common ducts are greatly narrowed or completely closed by a gall-stone, the pressure of a tumour, a plug of mucus, or by inflammatory swelling of the mucous membrane; or again, when any of the larger ducts within the liver are compressed, either by vascular congestion or other causes. When the common duct is obstructed the stools are white, since no bile can enter the intestine, but in the jaundice arising from febrile conditions, they are not necessarily altered in colour, but may, on the contrary, be bright yellow or very dark.

291. When the jaundice arises from a gall-stone it is preceded by very severe pain, aggravated in paroxysms,

referred to the gall-bladder or right scapula. During the paroxysms, the face is pale and covered with sweat, the pulse slow, the pain is not increased by pressure; vomiting of an acid fluid often takes place. In some cases there are rigors, and not infrequently there is an elevation of temperature during the attack. The pain generally terminates suddenly, and jaundice occurs a day or two afterwards. In such cases the stools should be well mixed with water and strained through muslin, so that any calculus that may have been passed may be discovered. Gall-stones are most common in persons of middle or advanced age, and are more frequent in females than in males.

292. If the closure of the gall-duct has arisen from inflammation of the mucous membrane extending from the stomach and duodenum, the jaundice is preceded by tenderness of the epigastrium, bilious vomiting or diarrhœa, white tongue, and loss of appetite. When repeated attacks of jaundice, unaccompanied by other disease of the liver, occur in a young person they usually depend on inflammation of the ducts; when in one of middle or advanced age, on the irritation excited by gall-stones.

The condition of the heart, kidneys, and right side of the chest should be always ascertained when jaundice is present.

B. The size of the liver is diminished.

293. *a.* You have jaundice *attended with diminution of the area of hepatic dulness*, pain in the epigastrium, vomiting, often of blood, restlessness, delirium, or coma, rapid pulse, increased temperature, thirst, dry brown tongue, and hæmorrhages from the nose, stomach, bowels, or uterus; or extravasations beneath the skin. The urine generally contains leucine and tyrosine.

The disease is *acute atrophy of the liver.*

Acute atrophy of the liver is a rare disease. It occurs chiefly in females, between the ages of fifteen and twenty-five, and is most common during pregnancy. It commences like an attack of catarrhal jaundice; the patient complains of headache, nausea, loss of appetite, disordered bowels, but the temperature is not elevated, or the pulse quickened. These symptoms are accompanied by a moderate amount of jaundice. The characteristic symptoms usually present themselves suddenly some days or even weeks after the appearance of the jaundice. Dilatation of the pupils is often first remarked, attended with headache, restlessness and inability to sleep, the temperature rises, but not to an extreme degree, and the pulse becomes quick. These symptoms are followed by delirium, sometimes by convulsions; hæmorrhage takes place from the nose or beneath the skin, or coffee-ground materials may be vomited. The tongue becomes brown, sordes collect around the lips and teeth, and the patient usually sinks into a state of coma.

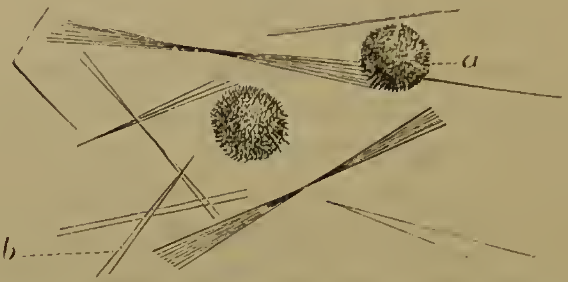
As soon as you have reason to suspect the disease, mark out the size of the liver by percussion, and you will find the area of dulness diminishes from day to day, until it is almost entirely replaced by the tympanitic sound of the intestines. The spleen is usually enlarged. There is tenderness on deep pressure over the liver. Death takes place in a few days after the appearance of the characteristic symptoms.

The amount of urea and of the other salts normally present in the urine is much diminished in the early stage; towards the close of the disease they are replaced by tyrosine and leucine. These may be found by evaporating the urine, when, if present, they form crystals, which can be detected by the microscope. Tyrosine forms needle-shaped crystals, arranged in bundles or stellate groups; leucine occurs in laminated crystalline masses (see figs. 82, 83).

294. *Perihepatitis* (*acute inflammation of the capsule of the liver*) accompanies various acute and chronic affections of the organ, such as alcoholic or syphilitic cirrhosis and abscess, but it is also not infrequently the result of inflammation of the gall-bladder. There is pain of the hypochondrium, increased on movement or coughing, tenderness on pressure and elevation of the temperature, without jaundice or other symptoms of an affection of the

liver itself. You must bear in mind, however, that pain in the right hypochondrium is not uncommon in the early stages of phthisis, and is then the result of a slight attack of pleurisy.

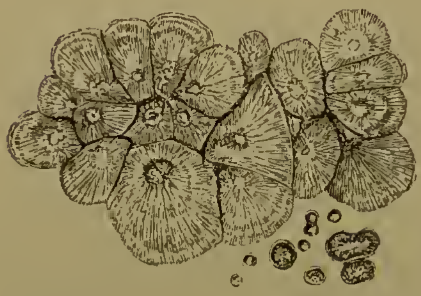
FIG. 82.



Crystals of tyrosine obtained by the evaporation of urine. (FRERICHS.)

295. You are most likely to mistake inflammation of the gall-bladder for perihepatitis, more especially as these affections are often associated. Inflammation of the gall-bladder is almost always due to the irritation set up by gall-stones, and if slight, it commonly subsides quickly after the passage of the calculus. But occasionally, suppuration occurs and extends to the biliary ducts. Under such circumstances, jaundice is usually present, the gall-bladder can be felt to be enlarged and is very tender on pressure, there is constant pain in the hypochondrium, increased by inspiration or any movement of the body, the temperature is high and of a hectic type, there are frequent rigors, the pulse is quick, the tongue dry and brown, and the strength of the patient rapidly declines. Perforation of the peritoneum may take place, or a localised abscess may result.

FIG. 83.



Crystals of leucine. (BEALE.)

SECTION II

THE DISEASE HAS COMMENCED GRADUALLY

296. First ascertain if the area of dulness of the liver is increased or diminished. If enlarged begin at (297); if it is diminished, or attended with dropsy, pass on to (317). In all cases examine and mark out the size of the spleen.

297. **A. The liver is increased in size.**
In this case, ascertain whether there are pain and tenderness on pressure, if so, pass on to (306); but if there is neither pain nor tenderness, begin at (299).

298. I must caution you against certain errors to which you are liable in estimating the size of the liver. Sometimes its lower edge is ill-defined, from impaction of fæces in the colon. Auscultatory percussion will usually prevent your making a mistake in this particular, but if you have any doubt, the colon should be emptied by an enema or a purgative. Or the liver may be pushed downwards by pleurisy with effusion, emphysema, dilated heart, distended pericardium (see figs. 14, 45), or by the use of tight stays or belts. To diagnose pleurisy with effusion from enlarged liver, you have the history of the case to guide you; in pleurisy the dulness reaches to a higher point behind than in front, and is attended with feeble vesicular murmur and diminished tactile fremitus, the liver is not depressed on full inspiration, and the heart is displaced to the left. Remember, however, that in certain disorders of the liver you may have co-existing pleurisy with effusion. Where tight-lacing has been practised, you will generally find some external evidence of it.

299. *a. You find the liver increased in size, but there is neither pain nor tenderness on pressure.* Under this head

you have fatty liver, lardaceous liver, enlargement in leuchæmia and Hodgkin's disease, and hydatid tumour. In the four first the enlargement is *uniform,* in the last it is *irregular in shape.*

300. *aa.* There is no pain in the right hypochondrium or epigastrium, the liver is *uniformly* enlarged, feels smooth and rather soft, but is not tender on pressure; the spleen is not enlarged; there is neither jaundice, dropsy, nor albumen in the urine; the patient is usually feeble and liable to diarrhœa.

The disease is *fatty liver.*

This affection most commonly occurs in persons affected with phthisis, in drunkards and in patients who have suffered much from syphilis or other exhausting diseases. Its chief characteristic is the absence of all symptoms leading to a suspicion of hepatic disorder.

301. *bb.* There is a feeling of fulness in the right hypochondrium, the liver is *uniformly* enlarged, it feels hard and smooth, but is not tender on pressure; the spleen is enlarged, jaundice is rare, but dropsy of the abdomen is often present; the urine is copious, and generally contains albumen; the patient is pale and anæmic, and is liable to nausea, vomiting, and diarrhœa.

The disease is *lardaceous degeneration of the liver.*

This malady generally occurs in persons who have suffered greatly from syphilis, scrofula, disease of the bones, or phthisis, or in those who have had long-continued suppuration from other causes. The condition of the spleen and of the urine are the most important points in the diagnosis, and it should be remembered that the lardaceous attains a greater volume than the fatty liver. In some syphilitic subjects the shape of the enlarged liver is not uniform, the organ being divided by one or more deep cicatrices.

302. As a lardaceous liver often attains a considerable bulk, you may have to diagnose it from cancer of the organ. In lardaceous liver the shape is uniform, the

surface smooth, the edge rounded and regular; there is no pain on pressure and few symptoms pointing to the existence of hepatic disorder; the enlargement takes place slowly, there is a history of chronic suppuration or syphilis, and it is usually accompanied by a similar affection of the spleen and kidneys. In cancer the shape and surface are irregular, the edge nodular, it is painful on pressure, the bulk increases quickly; jaundice is common, there is a rapid loss of flesh and strength, and usually a co-existing malignant disease of the stomach or intestines.

303. The liver is often uniformly enlarged without pain or tenderness on pressure in leuchæmia, but the large size of the spleen, the marked anæmia, and the increase in the number of the white blood-corpuscles will be sufficient to distinguish it (see leuchæmia). The organ may be also enlarged in lymphadenoma, but the co-existing enlargement of the lymphatic glands and of the spleen will prevent a mistake in diagnosis (see Hodgkin's disease).

304. *cc.* There is no pain or tenderness on pressure, but the liver is enlarged, *not uniformly*, so that it presents a swelling or tumour at some part of its area. The tumour is smooth, elastic, and sometimes gives a peculiar vibration to the fingers on percussion. There is no enlargement of the spleen, jaundice or dropsy, and the patient's general health is unaffected.

The disease is *hydatid tumour of the liver.*

As a hydatid tumour is unattended by any constitutional disturbance it generally first attracts attention on account of a feeling of weight or uneasiness in the right side. If suppuration, however, takes place, pain, tenderness on pressure, elevation of temperature and sweatings make their appearance, as in hepatic abscess.

In most cases the tumour is situated in the right lobe, and a globular, smooth and elastic swelling presents itself in the epigastrium or right hypochondrium. The absence of symptoms and of tenderness, together with its free movement on respiration, suffice to render its diagnosis tolerably easy. The "*hydatid thrill*" is best produced by percussing sharply over the fingers placed upon the tumour. It is often absent, and is most readily obtained in hydatid tumours situated in the peritoneal cavity. When the tumour is situated in the left lobe it may closely simulate an enlargement of the spleen. In such cases, always carefully inquire for a history of syphilis, and examine the blood in case anæmia is present. When the tumour is situated at the upper part of the liver the lung is compressed and it may be difficult to distinguish it from pleurisy with effusion. The history of previous pain, dyspnœa and fever will point to pleurisy, and the withdrawal of a small quantity of the fluid by an aspirator will settle the diagnosis. In hydatids the fluid removed will be found to be transparent, with a specific gravity varying from 1008 to 1013, it contains an abundance of chloride of sodium, but no albumen, and when examined with the microscope often shows minute echinococci or microscopic "hooklets."

If not relieved by treatment, the tumour may cause death by bursting through the diaphragm or into the peritoneal cavity, or it may evacuate its contents through the gall-ducts or some part of the intestinal canal.

305. Hydatid tumour may be confounded with abscess of the liver, enlarged gall-bladder or cancerous tumour. The history and the absence of constitutional symptoms distinguish it from abscess; the jaundice, site of the tumour, and perhaps a history of previous colic, serve to diagnose it from enlarged gall-bladder; whilst malignant disease will be recognised by the irregularity of the surface of the tumour, the pain and tenderness, and the rapid loss of flesh and strength that accompany it, and perhaps by the presence of cancer in some other organ of the body.

306. *b. You find a chronic enlargement of the liver, attended with pain in the right hypochondrium or epigastrium, and tenderness on pressure.*

Under this head are chronic congestion, abscess (288), and cancer. You may meet with *jaundice* in all of these, but it is very rare in abscess. In abscess and cancer the outline of the organ is in most cases *irregular*. Dropsy is usually present in chronic congestion, and often also in cancer of the liver.

307. Chronic congestion presents the same symptoms as when it is acute (287), but they are generally less severe. It results from diseased heart, ague, the abuse of ardent spirits, emphysema of the lungs, or any other condition that tends to congest the portal circulation. From the increased pressure exerted on the portal veins it is accompanied by the symptoms of gastro-intestinal catarrh. The tongue is furred, the appetite bad, nausea and vomiting, flatulent distension, constipation or diarrhœa are frequent subjects of complaint. Enlargement of the spleen can be often detected, and in the later stages albumen is usually present in the urine. Chronic congestion is frequently followed by contraction of the organ, and ascites is then produced. When the jaundice is slight the stools may be normal in colour, but if it exists to any considerable extent, they become pale and clay-coloured, from a deficiency of bile in the intestines.

308. In chronic congestion arising from heart disease you may meet with pulsation of the liver, which you must be careful not to confound with an aneurysm of the abdominal aorta. In aneurysm the tumour is well defined, is of a round or oval shape, is fixed and deeply seated; in pulsating liver the whole organ is enlarged, and can be felt to pulsate with each action of the heart; it is superficial and movable, and is accompanied by the symptoms and physical signs of dilated right ventricle.

309. Although acute hepatitis begins suddenly, yet an abscess produced by it may persist for a length of time. In such a case you will find enlargement with irregularity in the shape of the liver, and pain and tenderness on pressure; but, besides the history of the disease, your diagnosis will be assisted by the presence of fever, shiverings, sweatings, and emaciation.

310 *a.a.* There is severe pain in the right hypochondrium or epigastrium, with tenderness on pressure. The liver is

enlarged, its shape irregular, its edge and surface uneven; the spleen is seldom enlarged, but jaundice with dropsy of the abdomen and legs is frequently present. The patient is sallow, feeble, and emaciated.

The disease is *cancer of the liver.*

In three-fourths of the cases there is also a cancerous tumour of some other organ, usually of the breast, uterus, or stomach, and the glands of the neck are often enlarged. It rarely occurs below forty years of age, and the patient usually dies within twelve months. The jaundice, when present, is commonly produced by the pressure of enlarged glands upon the common bile-duct. In some cases there is little or no pain.

As cancer of the liver is usually secondary to malignant disease of some other organ, its earlier symptoms are most commonly those of the affection from which it has originated. When primary, it often begins very insidiously, with loss of appetite, flesh and strength, and symptoms of indigestion, before any indications of an affection of the liver manifest themselves. Pain may be at first slight, but it soon increases, and affects the epigastrium, hypochondrium or lumbar region. Nausea and vomiting are usually present, the temperature is at, or below the normal, the pulse quick and feeble. Jaundice and ascites occur in the majority of cases, but may be absent throughout the whole course of the disease. The liver may attain an enormous size; it appears to increase rapidly in bulk, is tender on pressure, feels hard and uneven. You can often manage to feel its under surface, especially in the female, by passing your fingers below the lower edge. Small nodules can be occasionally found in the abdominal walls.

311. Cancer of the liver is most liable to be mistaken for lardaceous and syphilitic disease, hydatids, or cirrhosis. In lardaceous degeneration the progress is usually very slow, there is no pain or tenderness, the spleen and kidneys are generally affected, and there is a history of caries of the bones, constitutional syphilis, or long continued suppuration. In syphilitic disease there is seldom much pain or tender-

ness; jaundice and dropsy are usually absent, there is not the same amount of wasting, anæmia, or feebleness as in cancer, and the patient has suffered from eruption on the skin, ulcers of the throat or tongue, or has had affections of the bones or periosteum. When the cancer is of a medullary character, it may be confounded with hydatid tumour, but the smoothness of the surface, and the absence of pain and constitutional symptoms will enable you to diagnose the latter affection. The enlarged stage of cirrhosis will be recognised by the smaller amount of pain, the slowness of the progress, the absence of other malignant tumours, and the history of intemperance. When jaundice arises from malignant disease, the colour of the skin is frequently of a very deep yellow, tending to a greenish-brown.

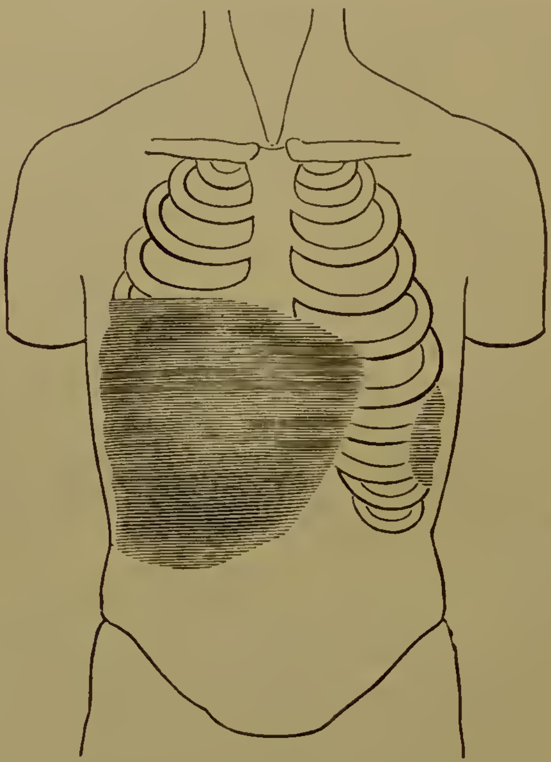
312. In some cases the gall-bladder, from long distension, forms a pear-shaped tumour, extending downwards. It is most likely to be mistaken for a hydatid tumour, but its situation, the presence of jaundice, and the probable history of gall-stones, cancer, or other disease of the liver will serve to distinguish it.

313. Jaundice arising from *obstruction* may be temporary or permanent. In the former case it is usually due to the irritation set up by the passage of a gall-stone, or to catarrh of the ducts originating in the duodenum. In the latter it may be caused by the impaction of a calculus, stricture or thickening of the duct by carcinomatous or other tumours, or by the adhesions resulting from perihepatitis contracting or closing the duct. From whatever cause the common gall-duct may have become obstructed the liver can be generally felt to be enlarged, but after this has lasted for some time contraction commences and the organ becomes reduced in size.

314. Certain symptoms usually present themselves in chronic cases of jaundice independently of those connected with the disease from which it has arisen. Thus, excessive flatulence and constipation are generally observed when the access of the bile to the intestinal canal is prevented, but in others diarrhœa is produced. From the imperfect

assimilation of the food there is a gradual failure in flesh and strength, the appetite diminishes, the patient loses energy of body and mind, the temperature is at or below the normal, the pulse often becomes very slow, severe itching of the skin is usually present, often to such a degree as to prevent sleep.

Fig. 84.



Not painful.

Fatty liver.
Lardaceous liver.
Hypertrophic cirrhosis.
Obstruction of the gall-duct.

Painful.

Congestion.
Cirrhosis in early stage.
Diffuse cancer.

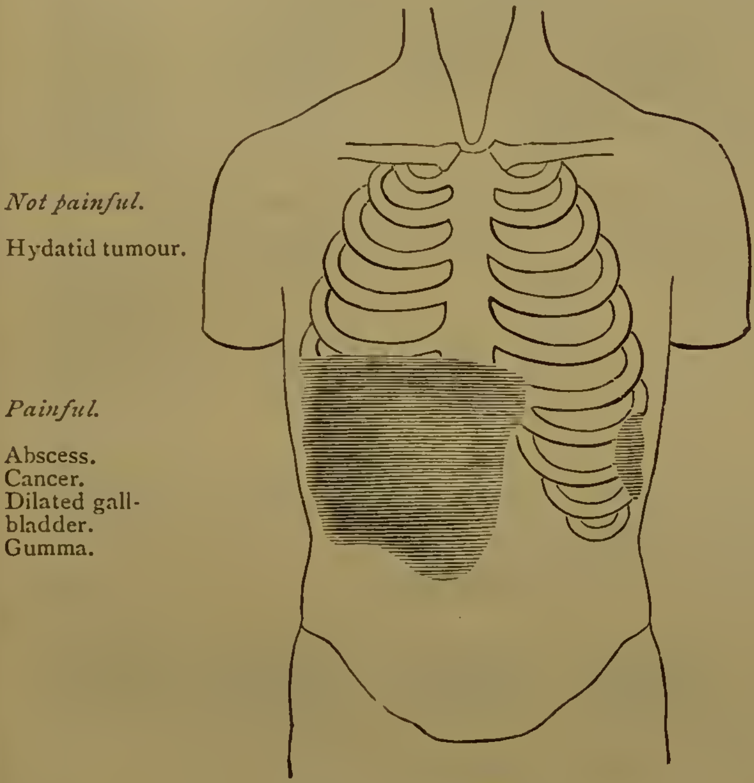
Uniform enlargements of the liver.

From the action of the biliary salts upon the blood, hæmorrhages from the mucous membranes are very apt to take place and may accelerate the fatal termination of the case.

315. There is often great difficulty in diagnosing the cause of chronic jaundice, where no organic disease of the liver can be discovered. In most cases it is the result either of an impacted calculus or of pressure on the common duct caused by cancer of the head of the pancreas or of some other deeply situated structure. When it has arisen from an impacted calculus, there is usually a history of previous attacks of biliary colic, or the jaundice has been preceded

by severe spasmodic pains in the epigastrium; in cancer the pain is often at first slight or absent, but increases as the case proceeds. Gall-stones are most common in the female, cancer of the pancreas in the male. In cancer the gall-bladder is usually more distended and can be felt as a well-marked tumour, the jaundice is more complete, there is less variation in the depth of the colour, and there is a more rapid loss of flesh and strength than in an impacted biliary calculus.

FIG. 85.



Irregular enlargements of the liver.

316. You may also divide the enlargements of the liver into two chief groups, according as the organ is *uniformly* increased in size, or is *irregular* in outline.

Fig. 84 shows the diseases in which the liver is uniformly enlarged. Fig. 85 those in which the enlargement is irregular in shape.

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF THE CHIEF SOLID ENLARGEMENTS OF THE LIVER.

——	Chronic Congestion.	Fatty Liver.	Lardaceous Liver.	Cancer.
Etiology	Abuse of alcohol, diseases of heart, emphysema of lungs	Abuse of alcohol, phthisis	Long continued suppuration, syphilis, phthisis	Usually follows cancer of breast or abdominal organs
Pain	Slight	None	None	Often severe
Tenderness on percussion	Moderate	None	None	generally moderate ; may be severe
Jaundice	Slight	None	None	Usually well marked
Ascites	Often present	None	Rare	Often present
Loss of flesh	Slight	Moderate	Severe	Severe and rapid
Other organs affected	Heart and lungs often diseased	Often phthisis	Kidney and spleen lardaceous	Cancer of some other organ
Progress of disease	Slow	Slow	Slow	Rapid
Shape of liver	Regular, not much enlarged.	Regular, not much enlarged	Regular, often greatly enlarged	Irregular, often greatly enlarged
Surface	Smooth and firm.	Smooth and soft	Smooth and hard	Hard and nodular
Spleen	Sometimes enlarged	Not enlarged	Enlarged	Not enlarged

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF THE TUMOURS OF LIVER THAT DO NOT FEEL SOLID.

—	Abscess.	Hydatid Cyst.	Enlarged Gall-bladder.
Etiology	Dysentery, residence in the tropics	Produced by tapeworm	History of attacks of biliary colic
Pain	Severe	None	Usually slight
Tenderness	Severe	None	Rare unless inflamed
Temperature	Elevated and remittent	Normal	Usually normal
Jaundice	Rare	Rare	Occasionally
Ascites	None	None	None
Loss of flesh	Rapid	None	None
Progress of disease	Rapid	Slow	Slow
Character of tumour	Usually rounded	Usually round or oval, perhaps thrill on percussion	Pear-shaped opposite ninth right costal cartilage.

317. **B. The liver is diminished in size.**

Before concluding that the liver is diminished, you must bear in mind the possibility of mistakes through the following conditions: The stomach and colon may be so much distended that you are unable to mark out the lower edge of the liver, or a portion of intestine may lie across and conceal it. If the lower border is very thin, and you percuss strongly, the resonance of a portion of gut below it may deceive you as to its actual size. Again, in some cases the front of the liver is puckered up by cicatrices, whilst the posterior part is enlarged. In all doubtful cases let the patient lie on his face and mark out the organ behind, as well as laterally and in front.

318. *a.* The area of hepatic dulness is diminished, especially over the smaller lobe; if the lower border can be

distinguished, it feels rough and uneven. There is usually ascites and the superficial veins of the abdomen are enlarged. The patient is dyspeptic, sallow, and much emaciated ; hæmorrhages are apt to occur from the stomach and bowels.

The disease is *cirrhosis.*

Cirrhosis is very rare amongst children, and, when it occurs, is generally from inherited syphilis. It is usually met with in men between thirty and fifty years of age, and is almost confined to those who have been in the habit of indulging in alcoholic stimulants. It may, however, occur in those who have suffered from syphilis, malarial fevers, or disease of the heart.

In *alcoholic cirrhosis* the patient may complain for months or years of the symptoms of chronic congestion of the liver. The face is sallow, in some cases jaundiced, the veins of the cheeks are dilated ; he suffers from a bad or capricious appetite, discomfort after food, nausea and vomiting, especially in the early morning; the urine is scanty, high coloured, deposits urates, or is tinged with bile ; the bowels are generally relaxed and there is a tendency to bleeding piles. In this stage the liver can be generally felt enlarged and projecting below the costal margin, and it is tender on pressure. The stage of contraction is in some ushered in by an attack of hæmatemesis, in others by distension of the abdomen arising from ascites. As the ascites increases, the veins of the abdomen become enlarged and œdema of the lower extremities is observed, emaciation proceeds rapidly, the patient is feeble, and is oppressed by the accumulation of fluid in the peritoneum. In most cases the area of hepatic dulness is much reduced, or it may be difficult to discover it on account of the pushing upwards of the intestines ; but where there are adhesions the anterior surface of the liver may still be distinguished by palpation. If there is only a small amount of ascites a friction sound may sometimes be heard over the liver. The spleen can in many instances be felt to be enlarged. Most cases end fatally within a few months after ascites has presented itself, but in others life may be prolonged for a length of time.

319. The ascites arising from cirrhosis may be mistaken for that due to cancerous or tubercular peritonitis. In cirrhosis you have a history of an habitual indulgence in ardent spirits, the urine is loaded with lithates, and the dulness in the region of the spleen is increased, none of which are generally present in malignant disease. In cancerous peritonitis there are frequent attacks of pain, tenderness on pressure, rapid loss of strength and flesh, an early development of ascites, and tumours can be generally felt in the abdomen.

320. The ascites, however, often prevents your feeling any tumour that may be present, so that it may be necessary to withhold your diagnosis until the fluid has been removed by tapping. Tubercular peritonitis is most common in young persons, there is often a history of hereditary predisposition to phthisis, and you usually find evidences of disease in the lungs or pleuræ. There are, in addition to these, elevation of temperature, increased rapidity of pulse, tenderness on pressure, and, in most cases, a tumour caused by thickening of the omentum can be discovered. Remember that you often find tubercular consolidation of the lung in persons under thirty years of age who are affected with cirrhosis of the liver.

321. *Syphilitic* affection of the liver may present itself with or without ascites. In the former the organ can be generally felt to be enlarged, and the case runs a much slower course than one arising from the abuse of alcohol. In the latter, the liver is irregular in shape, but may attain an enormous bulk, with enlarged veins on the surface of the abdomen. The patient is usually thin, feeble, and generally out of health.

322. When the cirrhosis follows disease of the heart there is not the same amount of diminution in size as in alcoholic cirrhosis, and you have the history and

the physical signs of mitral disease to guide your diagnosis.

323. In *malarial cirrhosis* there is a history of long standing malarial fever, the patient is feeble and anæmic, the spleen much enlarged, there is an absence of a history of alcoholic excess, and the blood presents particles of dark pigment.

324. In *hypertrophic cirrhosis* there is loss of flesh and strength, along with dyspepsia, permanent jaundice is usually present, although the stools may be dark in colour, whilst ascites and hæmorrhage from the stomach and bowels are generally absent.

CHAPTER VIII

DISEASES OF THE MOUTH, THROAT AND ŒSOPHAGUS

SECTION I

Diseases of the Mouth

325. Oral Catarrh.—The mouth and gums are liable to inflammation, in which the mucous membrane is red, swollen, and tender on pressure, and pain and soreness are felt in chewing, or other motions of the tongue and lips. The saliva is not necessarily increased in quantity, and is not fœtid. The complaint is most common in childhood, but may occur at any age from atmospheric changes, irritation of carious teeth, the use of mercury, or during the course of acute fevers, such as typhus, scarlatina and measles.

326. Thrush commences as small isolated spots of a white colour, like pieces of curdled milk, upon the mucous membrane of the mouth, lips, or tongue. They are easily removed, and the subjacent membrane appears to be red and inflamed. The saliva is usually acid. When viewed with the microscope, the material is seen to be composed of the spores of a cryptogamic plant (*Oidium albicans*). The complaint is most common in the early months of childhood, but occurs also in adults who have become enfeebled by any chronic malady, such as phthisis, cancer, or diabetes.

327. Aphthæ (Follicular Stomatitis).—This complaint consists in the formation of small, flat, yellow-coloured

ulcerations, which are chiefly situated at the junction of the gum and the mucous membrane reflected on the lower lip, but which also present themselves in different parts of the mouth. They seem to begin in ulceration of the mucous follicles. Microscopically, the spores of the *Oidium albicans* are absent. The disease is most common in children during dentition or after measles, and is often associated with catarrh of the stomach and intestine.

328. ULCERATIVE STOMATITIS.—This usually begins near the lower incisor teeth, but rapidly spreads from thence along the gums. The gums are covered with patches of ulceration, which have a greyish white exudation upon them; the saliva is greatly increased and the breath fœtid. If the disease is not checked the teeth become loosened and may fall out. It is chiefly a disease of childhood, but may occur in an epidemic form amongst adults. Ulcerations of the lips, tongue, and cheeks, are also common in syphilis and in cases of poisoning by mercury.

329. NOMA (GANGRENOUS STOMATITIS) is chiefly met with in badly nourished children who have recently suffered from measles, scarlatina or some other febrile disorder. It commences as a hard swelling in the cheek, which becomes tense and red. Ulceration begins inside the mouth and finally perforates the cheek. If the patient survives long enough, necrosis of the jaw takes place, and the teeth fall out. There is seldom any pain or fever, but death ensues from exhaustion.

330. TONSILLITIS, or inflammation of the tonsil, occurs both as an acute and chronic affection. In *acute tonsillitis* the gland is greatly swollen, and the neighbouring mucous membrane is of a bright red colour and covered with mucus. It generally terminates in abscess, which bursts into the throat.

Chronic inflammation of the tonsil is not attended with suppuration, but the tonsils often remain permanently enlarged. Microscopically, they present a considerable quantity of fibrous tissue in addition to an increase in their normal glandular structure. The surface of the gland is often covered with small pits containing plugs of cheesy secretion.

331. SARCOMA and CANCER occasionally affect the tonsils, forming a hard swelling firmly connected with the adjoining structures.

332. TUBERCULAR ulceration of the tonsils sometimes occurs in the course of chronic phthisis.

333. DIPHTHERIA is a contagious febrile complaint arising from bacterial infection. The throat, especially the tonsils and soft palate, is coated with a thick, rough membrane of a dirty-white colour, that is quickly renewed if torn off. The mucous membrane below the exudation is of a dark red colour, and seems swollen, from the inflammation affecting the substance as well as the surface of the part. Microscopically, the false membrane is found to consist of threads of fibrine and cells which are intimately connected with the surface of the mucous membrane. An infiltration of leucocytes generally occurs into the connective tissue immediately beneath the epithelium. This may be so abundant as to compress the blood-vessels, and to give rise to gangrene.

The disease may spread to the posterior nares and to the larynx.

SECTION II

DISEASES OF THE THROAT

The chief symptoms that should induce you to suspect a disease of the throat are pain or soreness of the throat, swelling of the glands below the jaw or in the neck, difficulty or pain in swallowing. You must examine the throat in all cases in which you suspect it to be affected, by depressing the tongue with a spoon or spatula, whilst your patient is sitting opposite a bright light.

334. *a.* You observe the mucous membrane of the throat

of a red colour, with or without patches of ulceration; swallowing is painful and difficult. The tonsils are not greatly enlarged, but the uvula is elongated.

The disease is *acute pharyngitis.*

The slighter cases are usually the result of exposure to cold or damp, and are apt to recur in those liable to the complaint. They are attended with soreness or pain increased on swallowing, by cough, often by partial deafness, and are usually preceded, or accompanied, by a similar affection of the nares. There is but little alteration in the pulse or temperature. The more severe cases present themselves in those who have been exposed to impure air, such as the nurses and other attendants in hospitals, or they accompany scarlatina, measles, or other acute eruptive fevers. The temperature is elevated, the pulse quickened, the tongue foul, there is great feebleness and exhaustion, and ulcerations of the mucous membrane of the throat are often present.

335. In *chronic pharyngitis* the mucous membrane is inflamed, it may present a dry, glazed surface, or may be covered with thick, adhesive mucus. Round or oval elevations may be observed, and the veins are generally enlarged. It is usually attended with frequent cough and expectoration, hoarseness, or loss of voice, difficulty or uneasiness in swallowing; but in others a constant hawking, caused by the attempts to dislodge the adherent mucus, forms the prominent symptom. It is common in those who have suffered frequently from acute attacks, in persons who are addicted to an excessive use of alcohol or tobacco, or who are exposed to the inhalation of irritating dust, or who have to exert their voice in frequent speaking or reading aloud.

336. Syphilis is generally attended with ulcerations, which are round, deep, with elevated edges, or are superficial and irregular in shape; chronic inflammation of the back of the pharynx is a very common accompaniment of phthisis. An elongated uvula often keeps up a chronic cough.

337. *b*. One tonsil, or both, is of a deep red colour, greatly swollen, and tender on pressure, the uvula is enlarged, and the fauces are covered with mucus; there is great pain and difficulty in swallowing, and the patient speaks through his nose. The pulse is quick, the tongue foul, the skin hot, and the glands at the angle of the jaw are enlarged and tender.

The disease is *acute tonsillitis* (*quinsy*).

The complaint begins suddenly with chills or a rigor, followed by fever, the temperature often reaching 103° or 104°; the pulse is quick, and the patient complains of soreness of the throat attended by headache and pains of the body and limbs. The pain in the throat soon becomes severe and is augmented by swallowing, there is an increased secretion of saliva and mucus, which from the difficulty of swallowing often dribbles from the mouth. The voice is thick and muffled, but there is no dyspnœa, unless both tonsils are enlarged; the tongue is coated, thirst is complained of, and there is an absence of appetite. The affected tonsil is large, swollen and projects towards the middle line, the mucous membrane is red and covered with mucus. There is pain on pressure over the tonsil and at the angle of the jaw. The inflammation may subside in a few days, but it often ends in suppuration, which may be recognised by the occurrence of slight rigors, a throbbing sensation in the throat, severe pain extending to the ear, while the tonsil can be felt by the finger to be soft or fluctuating.

Acute tonsillitis generally arises from exposure to cold, and is very apt to recur in those liable to it; it accompanies scarlatina, diphtheria and measles, and not infrequently ushers in an attack of acute rheumatism.

338. In some cases of scarlatina inflammation of the throat and tonsil may be present without any eruption on the skin, so that the general affection may be overlooked. Scarlatina occurs chiefly in early childhood, whilst uncomplicated tonsillitis is rare at that time of life; it prevails as an epidemic, so that in any doubtful case you must ascer-

tain if other members of the family have recently suffered from it, and you should carefully examine the skin at each visit, in order to detect any appearance of eruption (see Scarlatina).

339. *Follicular tonsillitis* also begins as an acute disorder, with pain and soreness of the throat increased by swallowing. There is generally a moderate elevation of the temperature and the pulse is quickened. Both tonsils are usually red and swollen, with small patches of secretion scattered on their surface. It usually arises from cold, but is often attributed to the effects of imperfect drainage.

340. Where the patches are large the complaint may be confounded with diphtheria, and, in fact, whenever the latter complaint exists in an epidemic form, every affection of the throat should be looked upon as suspicious. In follicular tonsillitis the secretion is pulpy, not membranous, as in diphtheria, it can be easily washed away, and does not leave a raw surface beneath it. The patches are more isolated, do not spread rapidly, and there is less disturbance of the general health than in diphtheria. In all cases of doubt, the secretion should be examined for the micro-organism that characterises diphtheria.

341. The tonsils are often permanently enlarged, either as the result of an acute attack, or from a feeble state of the general health. Persons so affected are very liable to acute tonsillitis. In young children enlarged tonsils often give rise to difficulty of breathing, and the deficient expansion of the lungs tends to produce an alteration in the shape of the chest; in other cases chronic cough and deafness are the results.

342. *c.* You see the palate, fauces, or pharynx of a vivid red colour, coated in parts with a thick greyish-white exudation, which, when peeled off, leaves the subjacent membrane red and bleeding, and is soon renewed. There are great prostration of strength, a quick, small pulse, increased temperature of the skin, thirst, and loss of appetite.

The disease is *diphtheria.*

Diphtheria generally prevails as an epidemic. It is very contagious, and may be communicated either by the breath of the patient, or by vessels or clothing that have become contaminated with the secretions of the affected part. It is most common in childhood, but may affect persons at any age. The period of incubation is said to vary from two to five or six days.

The disease is ushered in with fever, swelling of the submaxillary and cervical glands, soreness of the throat, and difficulty of swallowing. The amount of fever varies greatly; in some there is little elevation of the temperature, in others it rises to 103° or 104°, but in most it soons falls to a little above the normal. It runs no definite course. The pulse is always quick and feeble, and there is great prostration of strength. The urine is usually albuminous, sometimes bloody. The diphtheritic exudation may extend into the larynx and bronchial tubes, causing the symptoms of croup, or the complaint may attack the nostrils, producing a great discharge of mucus or hæmorrhage; in other cases it is attended by pneumonia.

In favourable cases the complaint usually terminates within ten days, but convalescence is generally slow. Within three weeks after recovery paralysis of the soft palate often occurs. There is then difficulty in swallowing, fluids are regurgitated through the nose, or the muscles of the larynx are implicated and the voice sinks to a whisper, or is lost. This is frequently followed by loss of power in the lower limbs, attended with an absence of the knee jerks, or other portions of the body may be paralysed. In most cases slow recovery takes place. In diphtheria death may ensue from exhaustion, from laryngeal obstruction, bronchitis or pneumonia; in rare cases it occurs very suddenly from failure of the heart.

343. As diphtheria sometimes accompanies, or follows, scarlatina, it may be difficult to determine its presence, where the throat is severely affected by the fever. A patch of false membrane on the throat, which is easily

removed, but is quickly renewed, attended by the presence of albumen in the urine at an early stage of the fever and by great prostration of strength, would point to the coexistence of diphtheria, and this would be confirmed if paralysis of the throat or limbs afterwards took place.

344. As diphtheria is the result of the action of a micro-organism which can be detected in the superficial layers of the exudation, the secretions should be carefully examined in every case of a doubtful character. In order to examine for the bacillus of diphtheria, you are recommended to squeeze a minute portion of the false membrane removed from the throat between two cover glasses, to dry it, and then to stain with alcoholic methylene-blue solution, or with gentian violet. The bacilli are in the shape of rods which are slightly bent, they are about the same length as tubercle bacilli, but much thicker, one or both ends being often slightly swollen. Other micro-organisms can usually be discovered along with them.

SECTION III

Diseases of the Œsophagus

345. Stricture of the Œsophagus is rare, excepting as the result of cancer. In some cases ulceration is caused by the patient swallowing a corrosive fluid, and when this heals, a contraction takes place which produces a stricture. Occasionally you will find the inner wall of the œsophagus infiltrated with a flat-celled cancer (epithelioma), which causes great narrowing of the lumen of the tube. The usual seat of the growth is opposite the bifurcation of the trachea. The disease may ulcerate into the trachea or perforate the pleural cavity. *Spasmodic stricture* of the œsophagus chiefly occurs in hysterical females and in drunkards.

346. *a.* There is no apparent affection of the throat, but the patient is unable to swallow solid food, excepting in small morsels. A bougie passed down the œsophagus meets with an obstruction.

The disease is *stricture of the œsophagus.*

The symptoms of a stricture of the œsophagus usually arise from a cancerous growth, the cicatrix produced by the healing of an ulcer, the pressure of an aortic aneurysm, or from spasm arising from hysteria or dyspepsia.

347. In nervous females there is occasionally great difficulty in swallowing solids, and liquids can be only taken slowly and with an effort. The attacks come on suddenly and may last for some time, but the symptoms vary in severity or now and then may disappear. Other evidences of hysteria or dyspepsia, such as palpitation, hiccough, excessive flatulence, or constipation are also usually present.

348. In aortic aneurysm the difficulty of swallowing often varies in degree from day to day, or with the position of the patient, there is almost always pain in the back or shoulders, and you will generally be able to discover physical signs indicating its presence. It is most apt to present itself in the later stages of the disease.

349. Cancer is the most common cause of the obstruction, and usually occurs in males, at or past middle life. The symptoms begin slowly; first there is a difficulty in swallowing pieces of solid food, then gradually the powers of deglutition decrease, until only mouthfuls of fluid can be taken. The food is regurgitated, either directly after it has been swallowed, or a short time afterwards, according to the position of the stricture. Great distress and pain are experienced until it is returned, and it is often mixed with blood or pus, or particles of the cancerous growth may in some instances be detected in it by the microscope. There is rapid loss of flesh and strength, and the patient dies from exhaustion or from pneumonia set up near the stricture.

350. In the diagnosis of a contraction of the œsophagus

you may introduce a bougie or may employ auscultation. The commencement of the œsophagus is about six inches, and the opening into the stomach about sixteen inches, from the teeth. In spasmodic stricture the bougie may be at first obstructed, but a little firm pressure causes it to pass downwards. In cancer the narrowing is distinctly felt, and the size of the bougie that can be introduced will enable you to estimate the tightness of the stricture. Never attempt to use a bougie when you have reason to suspect the presence of an aneurysm, as fatal consequences have followed such a procedure. In using auscultation place the cup of the stethoscope upon the dorsal spine and listen when the patient attempts to swallow. A gurgling sound will be heard as far down as, but not below, the stricture.

351. In *catarrh of the œsophagus* pain and soreness are complained of in swallowing. The patient describes the feeling as if the œsophagus was raw from the throat to the stomach, and the food can be felt as it passes down over the sensitive mucous membrane. There are always other dyspeptic symptoms, and it is most common in persons predisposed to gout or rheumatism.

CHAPTER IX

DISEASES OF THE STOMACH

The principal diseases of the stomach are—congestion, acute, sub-acute, and chronic gastritis, ulceration, dilatation, cancer, and fatty and lardaceous changes.

352. If digestion has been in progress at the time of death, the mucous membrane will be found partially or wholly dissolved by the gastric juice. You must be careful not to mistake the changes thus produced for those of disease. When post-mortem solution has taken place, the mucous membrane is smooth, very thin, more translucent than usual, softened, or so entirely dissolved that the subjacent muscular coat is left bare; the veins are filled with black blood, and their contents can easily be squeezed out. The splenic region is most commonly affected, and a well-defined line often shows the height to which the digestive fluids have reached. Sometimes only the summits of the rugæ are softened, but in other cases the whole of the coats are dissolved, and the contents of the stomach may be found in the peritoneal cavity, or even in the pleura. The extreme degrees of softening are most common in children, in persons dying of brain diseases, or in those in whom death has taken place whilst digestion was in progress.

You must remember that the mucous membrane of the stomach is almost entirely composed of glands of a tubular form. From the loose manner in which these are united together, the first appearances of disease can be readily distinguished by the microscope, and you have therefore, in the stomach, a favourable opportunity of studying morbid changes as they affect glandular structures in general.

353. Congestion of the Stomach.—The mucous membrane is covered with a tenacious layer of mucus, it is thickened and of a deep red, almost purple colour; its rugæ are very prominent, and the vessels are enlarged and full of blood. Occasionally small, round, dark-coloured spots present themselves, which are due to minute extravasations of blood. Microscopically, the vessels are much congested, the coats of the veins often thickened, but the contents of the tubes consist only of gastric cells.

The effect of congestion is to lessen the normal amount of gastric juice secreted, and thus to impair digestion. It is generally the consequence of some obstruction to the escape of the venous blood from the stomach, such as occurs in disease of the heart, liver, or lungs.

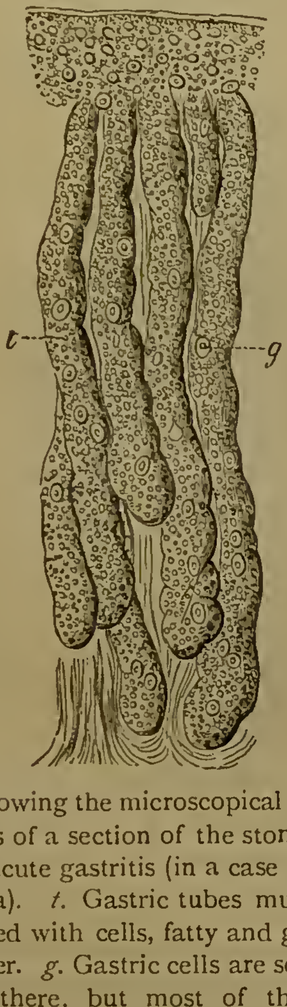
354. Sub-acute Gastritis, or sub-acute inflammation of the mucous membrane of the stomach, is much more common than *acute gastritis*, which is rarely met with excepting as the result of irritant poisons. In *sub-acute gastritis* the stomach is small and contracted, the morbid appearances are those of congestion, often attended by superficial ulcerations. Microscopically, the blood-vessels are injected, the gastric tubes are filled with cells, granular and fatty matters, and in some cases with blood. The disease is often met with in persons affected with anæmia, disease of the kidneys, heart, or uterus, and is almost always found in those who have died of scarlatina, measles, or other eruptive diseases (see fig. 86).

You will remark that the morbid changes are analogous to those that occur in the kidney in parenchymatous nephritis (see fig. 52).

355. Chronic Gastritis occurs under different forms. When present in an extreme degree the whole organ is small, globular in shape, very much thickened, and it does not collapse when cut open; but, as a rule, the thickening is confined to the pyloric region. When the mucous membrane

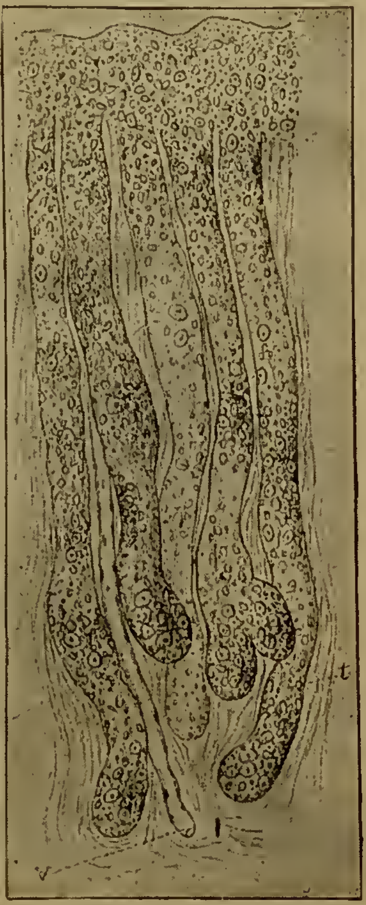
is alone affected with chronic inflammation, it is of a slate, grey, or dark colour, uneven on the surface, or warty ("*mammillated*"), thickened, and dense. Microscopically, the gastric tubes are at first firmly united together, the blood-vessels are enlarged and often thickened; at a later stage the contents of the glands undergo fatty degeneration and the tubules are finally replaced by fibrous tissue (see fig. 87). The solitary glands are generally enlarged.

FIG. 86.



Showing the microscopical appearances of a section of the stomach in sub-acute gastritis (in a case of scarlatina). *t.* Gastric tubes much distended with cells, fatty and granular matter. *g.* Gastric cells are seen here and there, but most of them are concealed from view by the inflammatory products.

FIG. 87.

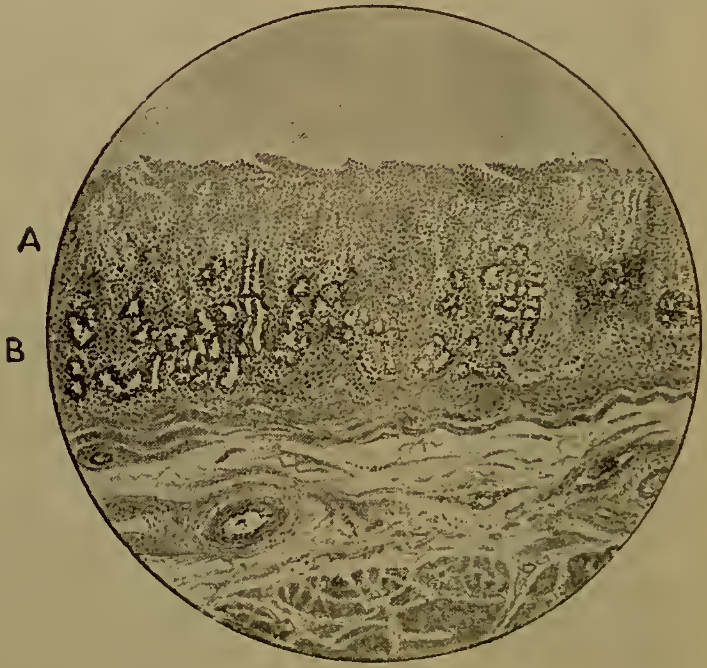


Chronic tubular gastritis. *t.* Gastric tubes filled with granular and fatty débris. *v.* Blood-vessel.

In certain cases the inflammation commences in the connective tissue between and around the tubules. Subsequently fibrous tissue forms in these positions, which by its contraction produces compression and atrophy of the secreting structures (fig. 88).

Chronic gastritis is a common result of long-standing congestion, and is therefore a frequent accompaniment of diseases of the liver and heart; it is also generally present in those who have been in the habit of indulging to excess in ardent spirits. In the growth of connective tissue between the gland structures and the atrophy of the secreting tubes by the subsequent contraction of the newly formed fibres, we have a morbid process analogous to what occurs in the kidney in interstitial nephritis (fig. 53), and in the liver in cirrhosis (see fig. 76).

FIG. 88.



Section of the stomach in a case of chronic interstitial gastritis, showing the formation of fibrous tissue in the mucous membrane (A). Cystic disease of the glands (B).

356. Ulceration of the Stomach presents itself under different forms. 1. As *superficial erosions*, resulting from ulceration of the punctiform hæmorrhages which so often accompany congestion and sub-acute gastritis. 2. The *acute perforating ulcer*. You may meet with one or several circular ulcers penetrating the coats of the stomach. The edges are as sharp as if they had been punched out and the circumference of the sore decreases as it proceeds outwards, so that if it has passed through the peritoneum, the perforation of that membrane may be a mere pinhole or chink. This kind of ulcer is chiefly met with in young persons, and may give rise to fatal peritonitis by perforation. 3. The *chronic gastric ulcer*. In this the edges are raised, and the surrounding structures are hard and condensed, the surface is formed by the coats that are not perforated, or by some other organ, such as the liver or pancreas, with which adhesions have been contracted. It varies greatly in size, and is most common at the smaller curvature near the pylorus. 4. *Sloughing ulcers* are occasionally found in persons much reduced by syphilis or diseased kidneys, and who during life may have presented no symptoms of gastric affection.

Ulcers of the stomach tend to heal, and, if of large size, their cicatrices may distort the shape of the organ, and give rise to dilatation by contracting the pyloric orifice. They may produce death by exhaustion, by hæmorrhage from erosion of a large blood-vessel, or by peritonitis set up by perforation of the peritoneum.

357. Fatty Degeneration of the Stomach is a common affection; the mucous membrane is pale, soft, and easily torn. Microscopically, the gastric tubes are filled with large, fatty, and granular gastric cells; the basement membrane is thin and very transparent; at a later stage the whole structure seems to be composed of fat. This condition often accompanies cancer, phthisis, and other wasting disorders.

358. Lardaceous Disease of the Stomach is usually

associated with a similar state of the liver, spleen, and kidneys. It is recognised by the brownish-red tint given to the tissues by a weak solution of iodine. The disease commences in the arterioles which ramify between the gastric glands, and afterwards affects the secretory structures. It is most common in advanced cases of phthisis.

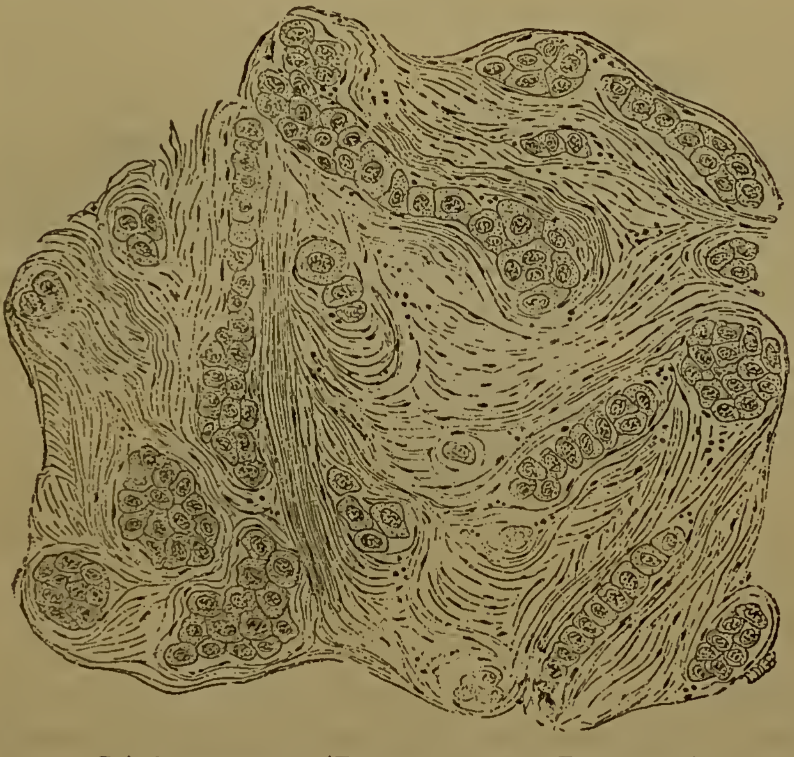
359. In Dilatation of the Stomach the organ is greatly enlarged, sometimes so much so as to fill the whole abdominal cavity (fig. 94); its coats are thin, and, when examined with the microscope, present signs of chronic gastritis.

Dilatation is usually produced by a narrowing of the pylorus or duodenum, which prevents the free evacuation of the contents of the organ. This may arise from (1) cancer of the pylorus; (2) cicatricial contraction of an ulcer; (3) pressure by tumours of the liver, omentum, or gall-bladder; (4) weakness of the muscular coat of the stomach from simple atony, fatty or lardaceous disease.

360. The stomach is a frequent seat of Cancer, and as its structure affords a very favourable opportunity for investigating the mode of growth of cancerous tumours, it will be advisable here to describe their microscopical characters. Carcinoma, or cancer, is a new growth which originates in epithelium and invariably exhibits an epithelial structure. Microscopically, all cancers agree in presenting cells of various shapes and sizes, having large and distinct nuclei, often nucleoli. The cells conform in type to those of the tissue from which they grow (pavement, cylindrical, glandular), and are grouped together *without any intervening structure between them.* It is this absence of intercellular substance between the individual cells that serves to distinguish cancer from many other forms of tumours. The cancer cells are contained in hollow spaces formed by connective tissue, which spaces communicate freely with each other. Blood-vessels are contained in the connective tissue, but do not penetrate amongst the cells. All cancers are

malignant—that is, they implicate the neighbouring structures, usually recur after extirpation, have a tendency to affect lymphatic glands, and give rise to structures similar to themselves in other organs of the body. The disease is probably due to a parasite (protozoon). Other tumours of a different structure may present the characters of malignancy, so that the mere recurrence of disease after a surgical operation does not prove it to have been cancer. Cancers are usually divided into four principal groups—scirrhus, epithelioma, medullary, and colloid.

FIG. 89.



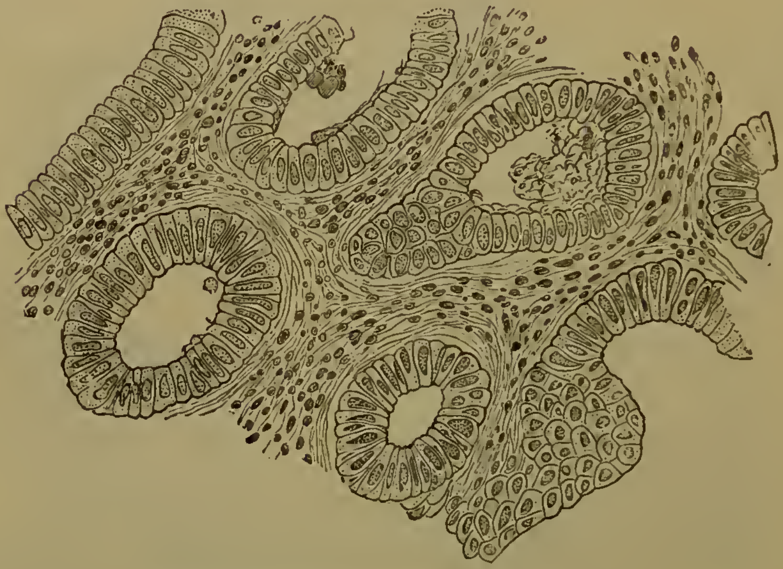
Scirrhus cancer. (DELAFIELD AND PRUDDEN.)

361. *Scirrhus* forms a dense, hard tumour, which presents on section a fibrous, glistening surface. Microscopically, it is characterised by the preponderance of connective tissue as compared with the epithelium. The cells are of various shapes and sizes, and are included in hollow spaces

formed by thick connective tissue. In the earlier stage the cells are abundant, but afterwards they undergo fatty degeneration, so that eventually the structure seems to consist chiefly of hard, thick bands of fibrous tissue. The favourite seats of this form of cancer are the breast and the pyloric end of the stomach (see fig. 89).

362. *Epithelial Cancer, or Epithelioma*, always occurs in superficial tissues which are normally covered with flat epithelium. It at first forms a small hard tumour, which subsequently ulcerates. Microscopically, the disease commences in the form of cylindrical processes of epithelium which grow downwards, infiltrating and destroying the surrounding tissues. The cells of these processes being subjected to considerable pressure assume a concentric arrangement, so that on section they appear as laminated capsules or "cell nests." When the disease starts in a mucous membrane (stomach or intestine) it exhibits a glandular appearance, the tubes being lined with cylindrical epithelium.

FIG. 90.

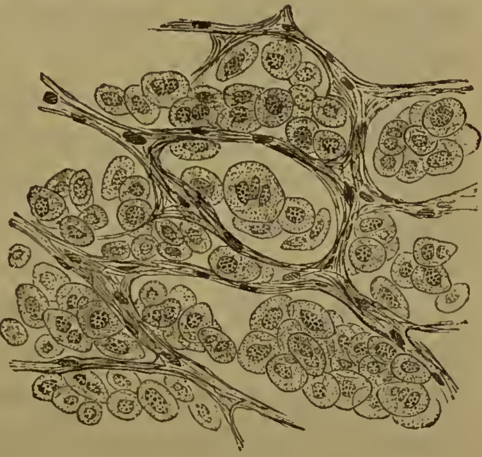


Cylindrical-cell epithelioma. (GREEN.)

363. *Encephaloid, Medullary, or Soft Cancer.*—This forms a large, rapidly growing tumour, which is characterised by its displaying a vast number of small cells, and a relatively small amount of connective tissue. It chiefly occurs in mucous membranes, and in the ovary, testis, and breast. It is very malignant.

364. *Colloid Cancer* usually commences in the stomach and intestines. The tumour has a gelatinous appearance, but is sometimes quite hard to the touch. Microscopically, this form of cancer is characterised by a colloid or gelatinous degeneration of its epithelial cells, so that a section may merely exhibit a number of spaces with fibrous walls.

FIG. 91.



Medullary cancer. (GREEN.)

365. CANCER OF THE STOMACH is most commonly met with at the pyloric or cardiac orifice, or at the lesser curvature. *Scirrhus* is most common at the pylorus. It forms a hard tumour, like cartilage, encircling and constricting the opening into the duodenum. When a section is made, the mucous membrane is generally found to be ulcerated, the tumour presents a fibrous appearance, traversed by bands; the ulcer has hard, round, projecting edges and an uneven surface. *Medullary cancer* is most frequent at the lesser curvature, where it forms a soft, fungoid, vascular tumour. Cancer of the cardiac orifice is usually epitheliomatous in character.

Cancer of the stomach is very liable to affect the neighbouring lymphatic glands, the liver, pancreas, and peritoneum. Adhesions are usually formed to the surrounding structures, even when the disease has not extended to them. When the cardiac orifice is obstructed the stomach is reduced in size, on account of the small amount of food that enters it. When the pylorus is constricted the whole organ enlarges, from the food being retained for a length of time.

The stomach sympathises with almost every organ, and you will consequently find it frequently in an abnormal condition. The symptoms that should direct your attention to it are—pain or uneasiness in the epigastrium or in the left or right hypochondrium, loss of appetite, nausea, vomiting, waterbrash, eructations, or excessive flatulence.

366. The tongue affords valuable indications of the condition of the gastro-intestinal tract, and also of the system at large. The chief points of which you must take notice are its size and colour, whether it is moist or dry, and the amount of epithelium or "coating" covering it. It is large, flabby, or indented with the teeth at its sides in persons suffering from general debility, and in many chronic affections of digestion; in cases of sub-acute gastritis it is often small and sharp at its extremity. Paleness is associated with general anæmia; redness of its surface, tip, edges, or papillæ usually accompanies sub-acute or chronic gastritis. When the tongue is covered with a thick fur, there is generally a similar condition of the mucous membrane of the stomach; where, as in scarlatina, it looks raw, different parts of the gastro-intestinal tract have usually been inflamed. Always remember, however, that an abnormal appearance of the tongue may be produced by local causes, such as inflammation of the throat or gums, by the habit of sleeping with the mouth open, or the excessive use of tobacco. In cancer and ulcer of the stomach the tongue seldom presents any characteristic appearances.

367. You may employ the following means of physical diagnosis to ascertain the state of the stomach—inspection, palpation, percussion, auscultatory-percussion, and the

microscopic and chemical examination of vomited matters, stools, and urine.

368. You must examine the abdomen quite free from clothing, and observe if the external veins are in any part enlarged, or if the normal shape of the epigastric or umbilical regions is altered. Thus, you may occasionally find a marked bulging or depression in some part of the abdomen, or the movements of the stomach or intestines may be visible.

369. You exert pressure in order to find if there is any tenderness in the region of the stomach; the sense of touch is employed to discover if a tumour is present. Tenderness is best ascertained by pressure with the tip of the finger successively applied to each portion of the epigastrium. Often the patient, especially if a female, will shrink from mere nervousness when the hand is applied over the region of the stomach; in such cases conduct your examination whilst her attention is diverted by conversation. A tumour is most readily felt when the patient lies upon the back, with the head and shoulders well raised with a pillow and the knees flexed upon the abdomen. In other cases you may be better able to detect it whilst he is sitting on his knees supported by his elbows. In either position, let him draw his breath fully so as to depress the abdominal organs, and examine carefully during full inspiration and during forced expiration. Always observe the shape and consistence of a tumour, whether the surface is smooth or nodular, if it be fixed or movable, if it is tender to the touch, and if it pulsates. Where there is much tenderness, the abdominal muscles may be so much contracted that it is impossible to determine whether there is a tumour of the deeper structures, or only an increased muscular tension. Under such circumstances you must employ an anæsthetic, so as thoroughly to relax the abdominal walls.

370. In estimating the size of the stomach, first percuss the lower edge of the liver and the right side of the spleen. The clear sound of the stomach is heard between these

organs; it is distinguished from the colon by the more tympanitic character of the sound. Auscultatory-percussion of the middle and pyloric regions is practised by placing the patient on his left side, and applying the stethoscope to a spot in the epigastrium, where you have previously ascertained by percussion that a clear sound exists; you then mark with a pen the point at which the impulse of the stroke of the finger ceases to be conveyed to the ear with equal force; next let the patient turn to the opposite side, and in a similar manner mark out the larger end of the stomach. In all doubtful cases examine both when the organ is full and empty; and you will often find it an advantage to have the bowels previously emptied by a purgative or an enema.

371. Various methods have been proposed for producing distension of the stomach and so ascertaining its exact dimensions. Thus, it has been recommended to let the patient take 20 or 30 grains of bicarbonate of soda dissolved in water, followed by a solution of 15 or 20 grains of tartaric acid. Others pump in air through an india-rubber tube, introduced through the œsophagus. It is generally sufficient to let the patient swallow one or two tumblerfuls of effervescing soda-water, the boundaries of the organ being determined by percussion and auscultatory-percussion before and after the liquid has been taken.

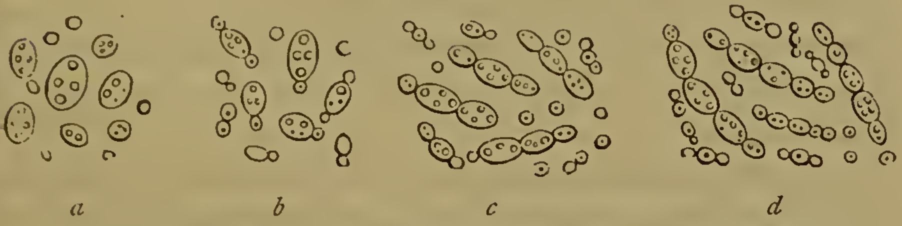
372. You examine vomited matters with the microscope for the purpose of detecting fungi, or any casts or portions of mucous membrane that may have been detached from the surface of the stomach. In the former case, remove a small quantity of the vomited matters with a pipette, place it on a slide or in a shallow cell, and add a drop of a weak solution of iodine. The iodine makes any starch that may be present of a blue colour, whilst it turns fungi brown. The principal forms of fungi you will meet with are torulæ and sarcinæ.

373. Torulæ appear like round or oval vesicles, many of which present little buds projecting from them, or

in a later stage of development they unite so as to form chains. They grow very rapidly whenever fermentation has taken place in the contents of the stomach (see fig. 92).

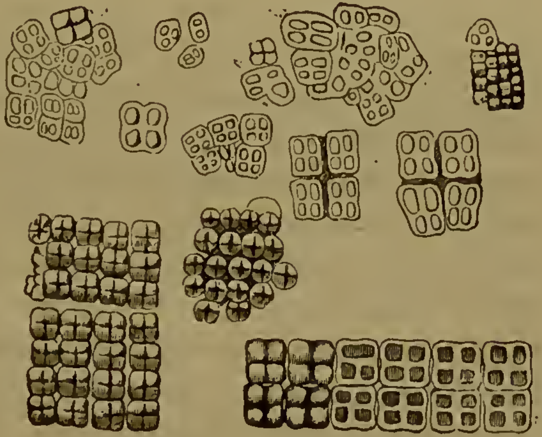
Sarcinæ are oblong or square bodies, divided into a number of cells of equal size by lines crossing each other at right angles; they are most frequently found in cases of obstruction of the pylorus or duodenum, but they may be present whenever the food is habitually retained in the stomach for an unusually long period (see fig. 93).

FIG. 92.



Torula Cerevisiæ, or Yeast-plant, as developed during the process of fermentation : *a*, *b*, *c*, *d*, successive stages of cell-multiplication.

FIG. 93.



Sarcina ventriculi.

374. You can only distinguish casts or pieces of mucous membrane when the fluids vomited are clear and free from food. Place the liquid in a conical-shaped glass, remove any particles that may subside with a pipette, and examine them in a shallow glass cell. "Casts" are of the shape of the pits on the surface of the stomach, or of the gastric tubes; two or three are often joined together. You

may mistake for them the sarcolemma of digested muscular fibres, but the latter are distinguished by their being transparent and often containing a few globules of fat. Particles of mucous membrane detached by ulceration are usually stained with blood, and exhibit the characteristic openings of the gastric tubes. You may mistake particles of bread, which also present little cavities, for them, but the holes are irregular in size and shape, and on crushing them it will be seen that they are not of animal origin.

375. The examination of the urine in cases of disorders of the digestion is very important; for instance, in diabetes the patient frequently complains more of disordered digestion than of an increase in the amount of the urine. Ascertain if there is any albumen or sugar, take the specific gravity, and note if there is any deposit, and if so, what its nature is (256). In many cases it is an advantage to ascertain the amount of acid contained in the urine, but for this purpose you must collect the whole amount passed in twenty-four hours.

376. Various methods have been employed to ascertain the rate at which the digestion proceeds, and the length of time during which the food is retained in the stomach. For this purpose the patient has been induced to swallow small india-rubber tubes containing iodide of potassium, the open ends being closed with fibrin, or pills of dried meat, enclosing the same salt, have been administered. These plans are of little value, however, as the iodide is so very diffusible it finds its way through the fibrin before its solution takes place. The motive power of the stomach has been tested by giving the patient a dose of salol, and testing the urine for salicyluric acid at frequent intervals by means of perchloride of iron. The estimation of a moderate loss of power of the muscular coat of the stomach is not of much practical value, but it is often of importance to discover when the food is retained for a length of time. For this purpose you may wash out the stomach in the early morning, before food has

been given, and so ascertain by microscopic examination whether any portion of the meals taken on the previous day has remained in an undigested state.

377. The secretion of hydrochloric acid is found to vary in different diseases of the stomach, in some being in great excess, in others deficient in amount. You must, therefore, practise yourself in ascertaining whether free hydrochloric acid is present in any doubtful case, for your diagnosis may depend upon the information thus obtained. The patient is requested to confine himself to a limited amount of food, and the breakfast is the most suitable meal for the purpose. It is generally advised that he should take only 1½ oz. of bread and about 10 oz. of water, but you may allow him weak tea with milk instead of the water. One hour afterwards a portion of the contents of the stomach is removed by an india-rubber tube and is systematically examined for the presence of free hydrochloric acid. Various tests have been proposed, but that of Günzburg is the most reliable. It consists of 2 grams. of phloroglucin, 1 gram. of vanillin, and 30 grams. of absolute alcohol. Place a few drops of this with an equal quantity of the fluid removed from the stomach in a porcelain capsule and heat it over a spirit lamp, when you will find it presents a rose red colour as it dries if free hydrochloric acid is present. A saturated solution of tropäolin, which is coloured red by the addition of hydrochloric acid, has been employed for the same purpose, but it is not so reliable as the above test.

378. You may also find it necessary to ascertain the presence of lactic acid in the contents of the stomach. The easiest method of testing for this acid is the following: "To about 100 gram. of a 2 per cent. solution of carbolic acid we add one or two drops of a solution of chloride of iron, when the mixture becomes steel blue. To this we add some of the stomach fluid. If lactic acid is present the solution is discoloured and becomes yellow or yellowish-green; on the other hand, if

there is only hydrochloric acid, the solution becomes clear like water."*

379. The appearance of the stools often supplies important evidence of abnormal states of the digestion. Sometimes an imperfect solution of the albuminous materials of the food is shown by lumps of undissolved muscular fibres; at other times (chiefly in children) the evacuations consist of masses of unaltered starch, the nature of which is easily recognised by the addition of a weak solution of iodine. A pitchy appearance of the motions, proving the presence of blood, often assists in the diagnosis of gastric ulceration and cancer.

Commence your inquiries by ascertaining whether the complaint has commenced suddenly, or gradually; if suddenly, begin at (380); if gradually, pass on to (391).

SECTION I

Acute Diseases of the Stomach

380. Under this head you have only bilious vomiting and acute gastritis. Both of these affections are usually accompanied by vomiting; but as this symptom is also often present in diseases of the brain, you may find it difficult to determine which organ is at fault. Remember that in gastric vomiting there is generally some tenderness of the epigastrium, nausea, or a sense of weight at the stomach; none of which occur in head attacks. In disorders of the digestion the tongue is foul and the bowels sometimes purged; in those of the brain the tongue is generally clean and the bowels obstinately confined; in the former, the headache is less persistent and intense, and giddiness, if present, is relieved by the vomiting; in the latter, various other symptoms, such as indistinctness of vision, loss of memory,

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* "A Clinical Text-book of Medical Diagnosis." By Oswald Vierordt, M.D.

convulsions, &c., are apt to supervene. When you suspect disease of the brain, never neglect to examine the optic discs with the ophthalmoscope.

381. Vomiting is a prominent symptom in many diseases besides those of the stomach. Thus it may arise from the irritation of biliary or renal calculi; it occurs in phthisis, in various affections of the intestinal canal, in acute and chronic diseases of the kidneys, in "Addison's disease," in certain chronic diseases of the spinal cord, in pregnancy, in displacements of the uterus, and in ovarian diseases. Whenever, therefore, it is a marked feature in a case, bear in mind that it may be only a reflex symptom and not necessarily an indication of a gastric disorder. Always ascertain whether it occurs shortly after food, or is independent of the digestive process, and if it relieves the other symptoms from which the patient suffers. Never neglect to examine the matters rejected from the stomach.

382. *a.* The patient suffers from *constant* vomiting, pain, or uneasiness, and also tenderness at the epigastrium; the tongue is red or coated; complete loss of appetite, with thirst, is also present. The pulse is quick and feeble, and there is great depression of strength.

The disease is *acute gastritis.*

The fluid vomited is composed chiefly of ropy, tenacious mucus, often streaked with blood. The severe forms occur most frequently in persons who have long suffered from diseases of the heart, kidneys, liver, or uterus, and often end fatally. A less dangerous variety occurs in rheumatism, gout, and in young females in whom the catamenial functions are disordered.

There are few diseases so difficult to describe as acute gastritis, as it varies greatly in severity under different conditions. It is often spoken of as *gastric catarrh*, but microscopic examination has shown that the secreting tubes of the stomach, and not merely the mucous surface of the organ, are usually the parts inflamed.

383. An *erythematous inflammation* of the stomach is

commonly met with in all fatal cases of the acute eruptive fevers, and is most marked in scarlatina, diphtheria, measles and pyæmia. Vomiting, with or without diarrhœa, absence of appetite, thirst, a foul or red and glazed tongue are the usual indications; but the attention of the physician is naturally attracted to the more important symptoms presented by the constitutional disorder from which the gastric complication has arisen.

384. A severe form of acute gastritis is apt to occur in persons suffering from disease of the heart, emphysema of the lungs, cirrhosis of the liver, or any other affection that obstructs the portal circulation. Under such circumstances, vomiting, loss of appetite, thirst, and tenderness on pressure over the epigastrium, present themselves, and are accompanied by feebleness of the pulse and general debility. Such an attack often hurries on the case to a fatal termination. The matters vomited are chiefly composed of thick, ropy mucus, and are often stained with blood.

385. Acute gastritis can be always found in fatal cases of acute "Bright's disease," and gives rise to the severe vomiting that so often accompanies that disorder. Persons who habitually suffer from chronic dyspepsia are liable to an exacerbation of its symptoms after exposure to cold or sudden changes of temperature. They then complain of nausea or vomiting, thirst, loss of appetite, constipation, a foul tongue, and great physical and mental depression. This is especially the case with those liable to gout or rheumatism.

386. Children are much more liable than adults to acute gastritis. The attack commences suddenly with a chill or even a slight rigor, and is followed by an elevation of the temperature, quickness of pulse, nausea or vomiting. There is generally pain or uneasiness at the epigastrium, sometimes severe; the tongue is furred, with enlarged and injected papillæ; thirst, absence of appetite, constipation or diarrhœa present themselves. Such attacks are apt to recur from time to time in those liable to them, and are readily induced by changes of temperature or indis-

cretion in the quantity or quality of the food. The illness may last for some time and it is often difficult to distinguish it from typhoid in the early stages. The onset is, however, more sudden, the temperature less elevated and varies less than in typhoid, the tendency to diarrhœa is less marked; whilst after the first week the absence of the characteristic eruption, of the enlargement of the spleen and the gurgling in the right iliac fossa will assist in the diagnosis.

387. The most severe and dangerous cases of acute gastritis are those due to irritant or corrosive poisons, and whenever the symptoms are severe in an adult, or long continued vomiting occurs without apparent cause, you must bear in mind this possibility. Ascertain, under such circumstances, if the pain at the stomach and the vomiting commenced shortly after food or medicine had been given; or, in chronic cases, if these symptoms follow or are aggravated after meals. Do not trust to the report of friends or nurses, but carefully examine for yourself whatever is rejected from the stomach or passed from the bowels.

388. In very rare cases gastritis occurs along with suppuration of the coats of the stomach. This is almost always the result of pyæmia, and the local symptoms are usually masked by those of the general affection which has given rise to the inflammation of the stomach.

389. Always examine the state of the heart when symptoms of acute gastritis are present, for pericarditis may exist without any other signs than pain and tenderness of the epigastrium and vomiting.

390. *b.* The patient is subject to attacks of vomiting of bile, mucus, or acid, which are accompanied by headache, a foul tongue, loss of appetite, thirst and confined bowels; the urine is scanty, and loaded with lithates; the pulse is seldom quickened, and the heat of the skin is not increased.

The disease is a *bilious attack* (*migraine*).

The pain of the head is usually very severe, and is often confined to one side, mostly about the orbit. The illness is often preceded by drowsiness and the frequent passage of pale urine; in some by an inability to see more than the half of an object or by flashes of light; whilst in others the patient complains of a partial loss of memory or of tingling in the face or limbs. The usual duration of an attack is from twelve to twenty-four hours, but occasionally the nausea and headache persist for days. Sometimes the headache is the only symptom. In the intervals between the attacks there are generally symptoms of chronic gastritis or atonic dyspepsia. The attacks may be only occasional and may result from some error in diet, or they may occur frequently without apparent cause; in females they are not uncommon at the catamenial periods. They usually commence about puberty and may continue for many years, but in most cases they become less frequent as old age comes on. If the vomiting should last longer than twenty-four hours, examine the fluids rejected from the stomach for torulæ, the presence of which in some cases keeps up an irritation of the mucous membrane.

Migraine has been supposed by some to be a neuralgic condition of the nerves; by others to arise from a functional affection of the brain. The majority of those affected suffer from indigestion, and especially from constipation; and when this latter is relieved, the tendency to the attacks is much reduced. They can be often traced to some error in diet, and can be warded off by a careful regimen. A heriditary predispositicn can be usually discovered, and in such cases it will be often found that the members of the family who are not liable to migraine are sufferers from various forms of chronic dyspepsia.

SECTION II

Chronic Disorders of the Stomach

391. Ascertain if there is pain in the region of the stomach, commencing or aggravated shortly after food, and if there

is tenderness of the epigastrium. If neither of these symptoms is present, begin at (392); if they are present, pass on to (395). If the stomach is found by percussion to be much enlarged, pass on to (410).

392. **A. Pain is either absent, or, if present, it does not commence, nor is it aggravated, shortly after food, and there is no epigastric tenderness.**

Under this head you have atonic dyspepsia and gastric neuralgia.

393. *a.* The patient complains of weight, tightness, or a feeling of discomfort during digestion. The tongue is large, flabby, or indented at the sides, often slightly furred; bad appetite, flatulence, eructations, coldness of the extremities, depression of spirits, feeble pulse, and confined bowels are also present.

The complaint is *atonic dyspepsia.*

The pain is seldom severe; it may be caused by flatulence, and relief is obtained when the gas escapes from the stomach; or it may take place when the stomach is nearly empty, and is then relieved by food and stimulants; or it precedes the rejection of a thin tasteless fluid (*pyrosis*). In some cases, however, the pain may be excessive, coming on during or immediately after eating, and apparently arising from the distension of the stomach in an unduly sensitive condition. This form is commonly met with in young females, and especially in those suffering from anæmia. By percussion the organ can be usually found to be dilated, so that it projects considerably below the navel. In all probability many of the symptoms of atonic dyspepsia arise from the imperfect contraction of the muscular coat, and any sudden movement of the patient will generally produce a splashing sound. There is frequently great nervousness, irresolution, or mental depression. The urine is copious, of a pale colour, and often deposits oxalates or triple phosphates. The complaint is common in the old and in feeble persons, and is often caused by insufficient food, anæmia, leucorrhœa, the excessive use of tea, and other causes tending to produce debility. The symptoms of atonic dyspepsia often replace or alternate with those of chronic gastritis.

394. *Gastric Neuralgia*, unaccompanied by an organic affection of the stomach, is a comparatively rare disease. It usually presents itself in anæmic persons, or in those affected with uterine or ovarian disorders, or who have suffered from gout, ague, or neuralgia in other parts of the body, or have been exhausted by intellectual efforts or mental distress. The pain is usually very severe and periodical, is relieved by food, and not increased by pressure. The diagnosis is mainly determined by the absence of any continuous loss of flesh or strength, by the pain being relieved rather than aggravated by food or by pressure, by the digestion being good in the intervals of the attacks, by a history of neuralgia in other parts of the body, of gout or ague, and by the inability to discover any other cause to which it can be attributed.

395. **B. Pain is increased shortly after food, and there is tenderness on pressure in the epigastrium.**

You may have under this head, chronic gastritis, ulceration, and cancer.

396. *a.* You find a dull pain or feeling of oppression shortly after food, sometimes vomiting of acid or mucus. The tongue is coated, and indented with the teeth, or red at the tip and edges. The patient is liable to acid eructations or heartburn, flatulence, thirst, burning of the hands and feet. The bowels are usually confined, the urine is high-coloured, and deposits lithates, lithic acid, or oxalate of lime.

The disease is *chronic gastritis.*

The symptoms vary greatly in degree. In some cases the pain is severe, in others scarcely felt; sometimes there is considerable tenderness, occasionally but little. In all probability, where the pain and tenderness are slight, but the tongue is foul, and thirst, acidity and flatulence are well marked, the complaint arises rather from congestion than inflammation of the mucous membrane. You must remember that when the patient recovers from chronic gastritis the stomach still remains for a time incapable of efficiently performing its functions, and thus many cases are followed by atonic dyspepsia.

Chronic gastritis frequently arises from the habitual use of indigestible food, too frequent meals, imperfect mastication, overfeeding, insufficient exercise, or the excessive use of alcohol or tobacco. It is a constant accompaniment of heart disease, affections of the liver, emphysema of the lungs, or any other condition that tends to produce congestion of the portal veins. It is common in those predisposed to gout or chronic rheumatism, and not infrequently an exacerbation of the gastric symptoms precedes an attack in the joints. It presents itself in those affected with chronic interstitial nephritis, and, in such cases, the evidences of intertubular gastritis can be always discovered by the microscope after death. It often occurs in consumption, and may distract your attention from the real source of danger. Whenever, therefore, you find an obstinate case, attended with much loss of flesh, you must carefully examine the condition of the lungs.

397. The chief difficulty in diagnosis is to distinguish between chronic gastritis and atonic dyspepsia. In chronic gastritis the uneasiness after food is more severe than in atonic dyspepsia, the epigastrium is tender, the pulse often quickened, slight feverishness and thirst are felt, especially towards night, the tongue is foul, and the urine often deposits lithic acid. In atonic dyspepsia there is no tenderness, the pulse is soft and feeble, the feet are cold, the tongue flabby, not much furred, and the urine deposits oxalate of lime or phosphates.

398. *b.* There are fixed and severe or sharp, cutting pains localised in the epigastrium, back or hypochondrium,

commencing or aggravated very shortly after food, also tenderness on pressure over the epigastrium, and vomiting of food with relief to the pain. Blood is sometimes rejected from the stomach, or the stools are of a pitchy character. The patient is emaciated, the pulse feeble, the skin cool and the bowels usually confined.

The disease is *ulceration of the stomach.*

Ulceration of the stomach may commence as an acute or a chronic disorder. The acute occasionally occurs in pyæmia, burns of the skin, typhoid or other eruptive fevers, diseases of the heart or liver; but it is more commonly met with in young females between the ages of fifteen and twenty-five. There may be no previous symptoms, the first indication being hæmatemesis, or peritonitis from perforation of the stomach, but in others these may have been preceded for a few days by some pain after food or other symptoms of indigestion.

Chronic cases are either the result of an acute attack, or commence insidiously with pain after meals. In the early stage the pain is only a feeling of discomfort after food, but it increases gradually until it becomes a severe wearing or burning sensation. It is sometimes relieved by position; thus, lying on the back gives relief if the ulcer is on the anterior part of the stomach or leaning over a chair alleviates the suffering produced by one on the posterior surface. Pain in the back is often a prominent symptom; it comes on shortly after food, and is referred to the left of the spine, near to the last dorsal or first lumbar vertebra. Vomiting is sometimes absent during the whole course of the disease. Vomiting of blood (*hæmatemesis*) also occurs in diseases of the heart and liver; but if it takes place when these are absent, and is accompanied by the other symptoms of ulceration, it renders the diagnosis almost certain.

The tongue is usually clean and moist, but if there is much co-existing catarrh of the stomach it may be covered with a white coating. The bowels are almost always confined, and constipation may present itself before any pain is experienced.

A tumour can never be discovered in an ordinary case, but in very rare instances, when there is much thickening about the pylorus, an obscure feeling of swelling may be detected. It, however, never presents the hard, nodular surface of cancer. What is vomited after having been retained in the stomach for an hour always contains an excess of free hydrochloric acid (377). There is no rise of temperature, unless inflammation has been set up round the ulcer. The patient usually loses flesh, especially in old cases, but emaciation takes place gradually. Occasionally the pain lessens or disappears for days together or for longer periods, leaving only occasional vomiting or other symptoms of indigestion.

Ulceration rarely occurs below ten years of age, but is frequent in females between eighteen and twenty-five. In old or middle age its duration is generally long, and the indications are well marked, but the symptoms may disappear for a time. It may destroy life by exhaustion, hæmorrhage, or perforation and consequent peritonitis. If the ulcer heals, it may produce contraction of the pylorus and dilatation of the stomach. In other cases adhesions take place between the stomach and the liver or the pancreas.

399. *Hæmatemesis* is generally preceded by nausea, sinking or uneasiness at the pit of the stomach, and is accompanied by a feeble pulse, paleness of the face, sighing, and other signs of faintness. It is sometimes difficult to determine whether the blood has come from the lungs or stomach; in the former case it is bright and frothy, in the latter dark, clotted, often acid; in hæmoptysis the attack is preceded by cough and expectoration, and is followed for some days by the expectoration of blood and mucus; hæmatemesis is preceded by pain or other symptoms of indigestion, and is followed by dark, pitchy stools, which prove that the blood has passed from the stomach through the

intestines (*melæna*). In every case where you suspect gastric ulcer examine the stools frequently, for blood may be discharged in considerable quantity without any hæmatemesis. Remember, however, that the stools may be rendered dark by iron or bismuth.

400. When *perforation* of the stomach or intestines takes place, the patient is suddenly seized with agonising pain in the bowels, attended with great prostration of strength, faintness, nausea, or vomiting. These symptoms are quickly followed by the extension of pain over the whole abdomen, distension and intense tenderness of the belly, and by collapse indicated by shrunken features, coldness of the skin, and a rapid, feeble pulse. Most cases of perforation die within eighteen or thirty-six hours, but some live for many days.

401. Occasionally, when the perforation takes place very slowly, adhesions of the peritoneum are set up, and the effused materials are enclosed by the neighbouring viscera. If the abscess thus produced still communicates with the stomach or duodenum the pus is, of course, mixed with gas. Usually the abscess is situated below the diaphragm, and if it contains gas it may push this muscle upwards, and the physical signs of such a condition (*subphrenic abscess*) may then closely resemble those of pyopneumo-thorax (168).

402. The symptoms of ulceration of the duodenum are similar to those of gastric ulcer, but the pain is usually referred to the right hypochondrium; it comes on at a longer period after a meal, vomiting is less frequent, and melæna is apt to be present without hæmatemesis.

403. You may find a difficulty in diagnosing gastric ulcer from cancer (406), some forms of dyspepsia, and affections of the spinal chord.

404. Dyspepsia, attended by severe pain after food, is usually found in young anæmic or hysterical females; the pain often intermits for days together, it ensues as much or more after liquid as after solid food, it is less dependent on

the digestive process, is less relieved by vomiting, and is never attended by hæmatemesis. The nutrition of the patient is less impaired, the tenderness in the epigastrium is more extended and is not confined to one particular spot. Always, however, be cautious in your diagnosis, for in such cases gastric ulcer may develop itself very suddenly.

405. In locomotor ataxia you often have severe attacks of pain in the epigastrium and vomiting (*gastric crises*). They differ from gastric ulcer in the pain being more intense and in its being unaffected by food, in the persistence of the vomiting and in the absence of tenderness on pressure. In the intervals of the attacks the patient does not suffer from any gastric trouble, there is an absence of the knee jerks, and there are usually other indications of disease of the spinal cord. There is never hæmatemesis, and the attacks seldom exceed a week or ten days in duration.

406. *c.* There are severe lancinating pains and tenderness in the epigastric or hypochondriac region, often confined to a circumscribed spot. A hardness or tumour can be detected, which is tender on pressure; there is vomiting of fluid, often having the appearance of "coffee grounds," which does not relieve the pain. The patient is feeble and sallow, the appetite is bad, and emaciation is both marked and progressive.

The disease is *cancer of the stomach.*

Cancer of the stomach begins in a slow and insidious manner. The patient loses flesh and strength and complains of want of appetite, discomfort after food, or other symptoms of indigestion. In most cases the pain is at first slight, but gradually increases in severity and frequency. It is usually worse after food, but is often very severe when the stomach is empty and during the night. It is not confined to the epigastrium, but may radiate to the chest or downwards to the abdomen. It may be, however, slight or entirely absent, especially if the patient is aged and the orifices of the organ are not implicated. The frequency of the vomiting varies much in different cases. There is rarely severe hæmatemesis, but often altered blood, or the appearance of "coffee grounds" presents itself in all the matters rejected by the stomach. There is always loss of appetite and of strength, emaciation, and often great depression of spirits.

In the majority of instances a tumour can be discovered in the epigastric, umbilical or hypochondriac region. It is dull on light percussion, but a forcible stroke brings out a tympanitic sound. It is usually tender, nodular on the surface and feels hard. When the cardiac orifice or the posterior wall of the stomach is affected it is generally impossible to discover a tumour.

In most cases there is an absence of free hydrochloric acid in the contents of the stomach withdrawn an hour after a "test breakfast," but occasionally this is not the case. In all doubtful cases the amount of free acid should be determined at intervals. It has been stated that lactic acid is only found in the gastric contents in cases of cancer, but this is doubtful. Portions of cancerous growth have been detected by the microscope in the contents of the stomach, chiefly where the cardiac orifice was the seat of the disease. The temperature of the patient is almost always subnormal and the pulse small and feeble.

The orifices of the stomach are more generally affected than the other portions. If the cardiac opening is attacked the food seems to stick behind the sternum, and is almost immediately returned; when the pylorus is the seat of the disease, pain occurs some time after food, and the stomach is liable to become dilated. In rare instances ulceration takes place into the colon, so that there is either diarrhœa caused by the rapid passage of the undigested food into the bowels, or vomiting of fæcal matters.

The patient seldom lives more than twelve or eighteen months from the commencement of the disease. It occurs chiefly in males and elderly persons; the liver is often secondarily affected, and jaundice presents itself.

407. The chief difficulty of diagnosis is between cancer and simple ulcer of the stomach. To distinguish between them, remember that cancer is often hereditary, and seldom occurs below forty years of age, it runs its course rapidly, the pain is more severe and neuralgic, less influenced by food, less relieved by vomiting than in simple ulcer, and the blood when vomited is smaller in quantity and of darker colour. Above all, no tumour can be discovered in simple ulcer of the stomach, whilst the sallowness of the skin and emaciation are more strongly marked in cancer. In the later stages of cancer the breath is sometimes fœtid. In simple ulcer there is an excess of free hydrochloric acid in the contents of the stomach examined one hour after a "test meal;" in cancer there is almost always a great deficiency, or an absence of it.

408. When there is an absence of pain and no tumour can be discovered, you are likely to confound cancer with "pernicious anæmia." In gastric cancer, however, there is often an hereditary predisposition, there is always great emaciation, and the temperature is commonly subnormal; in pernicious anæmia the patient often remains stout, there is great palpitation and dyspnœa on exertion, the temperature is frequently elevated for days together, and hæmorrhages can be frequently detected in the retinæ by the ophthalmoscope.

409. Fibroid thickening of the stomach (*cirrhosis of the stomach*) occurs very rarely. It may be associated with chronic peritonitis and ascites, or may exist as an independent affection. When there is no ascites, it is attended by the symptoms of indigestion, frequent vomiting, loss of flesh, and a well-marked round or oval tumour in the epigastrium. It may be impossible to distinguish it from a cancerous infiltration of the walls of the stomach. There is, however, in such cases rarely much pain or "coffee ground" vomiting, the tumour is not tender on

pressure, it is smooth on the surface, and there may be an excess, instead of a deficiency, of free hydrochloric acid one hour after a test meal.

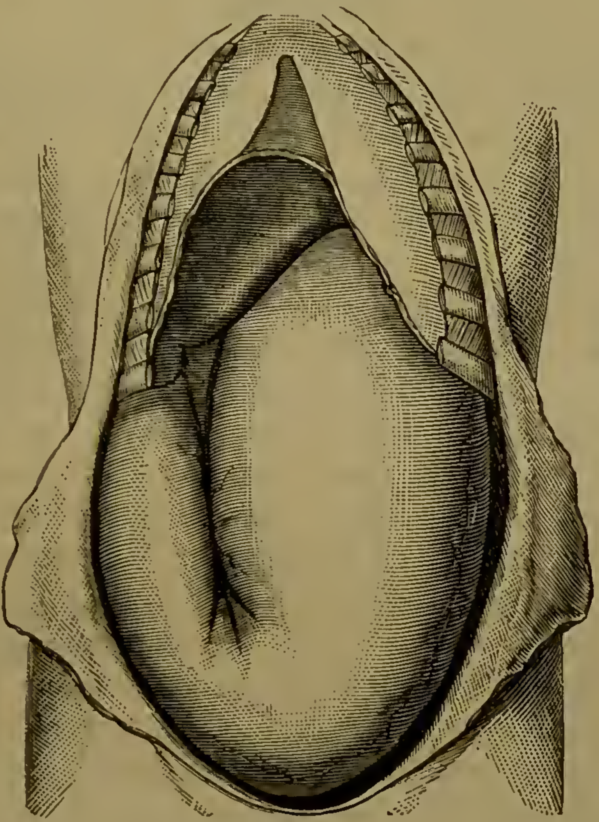
TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF THE PRINCIPAL ORGANIC DISEASES OF THE STOMACH

	CHRONIC GASTRIC CATARRH.	ULCERATION.	CANCER.
Associated with	Disease of heart, liver, or kidneys. Indulgence in alcohol	Patient otherwise healthy	Often cancer of liver, peritoneum, &c.
History of former attacks	Usually former attacks	Often a history of hæmatemesis	No previous attack
Age	At any age	Mostly young	Rarely below forty
Pain	May be absent, rarely severe	Very severe after food	Severe, but less influenced by food
Tenderness	General tenderness	Localised tenderness	More general than in ulcer
Vomiting	Occasional	Frequent after food	Frequent
Hæmatemesis	None	Occasional and to a large amount	Frequent, but in small quantities
Emaciation	Seldom	Slow	Rapid and progressive
Tumour	None	Very rare	In most cases
Progress	May last for years	Often lasts for years	Patient rarely lives above nine or twelve months
Free hydrochloric acid in stomach contents	May be present or absent	Usually in excess	Usually absent

410. **C. The stomach is much increased in size.**

411. *a.* The stomach is found by percussion to be much increased in size, the patient complains of a burning pain and of vomiting large quantities of sour, frothy, dark-coloured fluid, along with mucus, in which the microscope detects torulæ and sarcinæ; he is thin, pale, feeble, and emaciated.

FIG. 94.



Abdomen distended.

Superficial veins enlarged.

Movements of stomach often visible.

Percussion note tympanitic.

Vomiting of sour fermenting fluid containing sarcinæ.

Diagram of a dilated Stomach. (HILTON FAGGE.)

The disease is *dilatation of the stomach.*

A moderate amount of dilatation is not uncommon in various forms of dyspepsia, and can be detected by careful percussion. Extreme dilatation in very rare instances takes place rather quickly, but this is only in the last stage of exhausting disorders.

Dilatation of the stomach is usually a very chronic disorder, and may arise from fibroid or muscular thickening, cancer, or a cicatrised ulcer of the pylorus or duodenum; consequently the history of the case varies, but the previous symptoms will generally enable you to determine the cause of the obstruction. The vomiting does not occur, as in ulcer and cancer of the stomach, shortly after food, but usually takes place only once or twice a day, or it may be absent for many days, when *a large quantity* of frothy, fermenting, sour liquid is rejected, containing sarcinæ and torulæ (figs. 93 and 92). In rare cases tetanic spasms of the limbs have been observed, mostly after long-continued and frequent vomiting, or when the contents have been entirely removed by the œsophageal tube.

When the patient lies upon his back the left side of the abdomen appears to be unduly prominent and the epigastrium is often depressed, from the stomach being dragged downwards by the weight of its contents. The percussion note is tympanitic in the front, and is dull on the sides of the abdomen, but the line of dulness alters with every change in the position of the patient. The muscular contractions of the stomach are frequently visible. A portion of the abdominal wall is slowly elevated and again sinks into a hollow, whilst another part that was before depressed in its turn becomes prominent. This wave of peristaltic movement takes place from left to right, and may be provoked by gentle friction, by exposure of the skin to the air, or by the application of ice or cold water. The limits of the organ can be determined by smartly tapping in succession over different parts of the abdomen whilst the student listens with the stethoscope placed on a spot that affords a tympanitic note on percussion.

The thickened pylorus can be occasionally distinguished as a hard tumour, but this is not necessarily situated in the epigastrium, for it may be displaced by the weight of the enlarged stomach, and present itself even in the hypogastric or inguinal region.

CHAPTER X

DISEASES OF THE PERITONEUM AND INTESTINES

The most frequent diseases of these parts are: peritonitis, enteritis, typhlitis, inflammation and ulceration of the small intestines, intussusception, strangulation of the intestines, stricture, dysentery and malignant disease.

412. In Acute Peritonitis, or acute inflammation of the peritoneum, the serous membrane is opaque, reddened, and softened; the intestines are more or less adherent and covered with lymph; the abdominal cavity contains a turbid fluid or pus, which, when it is small in quantity, chiefly occupies the hypogastric and lumbar regions. Purulent exudation is most commonly met with in pyæmic and puerperal cases.

413. In Chronic Peritonitis the whole of the abdominal viscera may be matted together by adhesions, and pus may be collected between the coils of the intestines, or if the inflammation has been local, some organ may be firmly attached to the abdominal walls or to the adjoining parts. Microscopically, the same appearances are presented as in inflammation of other serous membranes.

The first effect of peritonitis is to set up fever; the muscular coat of the intestine becomes paralysed, the bowels are consequently distended with gas, the diaphragm is pushed upwards and the breathing impeded. In case of recovery, adhesions may form loops in which a coil of intestine may become entangled and strangulated.

Acute peritonitis is generally produced by: (1) extension of inflammation from some organ covered by the serous membrane; (2) escape of the contents of the stomach or intestines into the peritoneal cavity; (3) perforating wounds or other injuries to the abdomen; (4) Bright's disease; (5) pyæmia; (6) tuberculosis.

Chronic peritonitis may result from tubercle or cancer. The tubercle is deposited in the shape of small granulations beneath the serous membrane, the coils of intestines are closely united together, and not infrequently ulceration of the mucous membrane takes place, and fæcal abscess is produced.

414. The mucous membrane of the intestines presents inflammatory changes similar to those observed in the stomach. *Congestion* is a frequent result of diseases of the heart and liver. In *inflammation* (*intestinal catarrh*) the mucous membrane is soft, of a red colour, and covered with a layer of closely adherent mucus; in chronic cases it is often grey, thickened, and more tough and hard than in the normal state. When the inflammation is acute, the microscope shows the blood-vessels to be congested, the tubes of Lieberkühn choked with cells and granular matter, the solitary glands enlarged, the villi granular, sometimes atrophied, or altogether destroyed. Enlargement of the solitary glands occurs in inflammation of all mucous membranes.

Intestinal catarrh results from venous congestion produced by diseases of the heart, lungs, or liver, from cold and damp weather, or from irritation excited by improper food, or by an abnormal state of the bile or other secretions that are poured into the digestive canal. A diseased condition of the mesenteric glands often accompanies inflammation and ulceration of the intestines.

415. The term ENTERITIS is generally restricted to cases in which all the coats of a portion of the intestinal canal are inflamed. The part affected is found after death to be dilated from paralysis of the muscular coat, and usually contains blood or a dark-coloured fluid, the peritoneum

covering it is inflamed, sometimes adherent to the neighbouring portions of gut, the muscular tissue is soft, swollen, and of a dark colour, and the mucous membrane is much congested and covered with a layer of mucus.

416. Inflammation of the Cæcum is named *typhlitis*, that of the colon *colitis*. The mucous membrane of the large intestine presents morbid appearances similar to those observed in other parts of the intestinal canal; chronic ulcerations are often met with in persons who have died of other visceral diseases.

Typhlitis is often due to the accumulation of fæces in the cæcum.

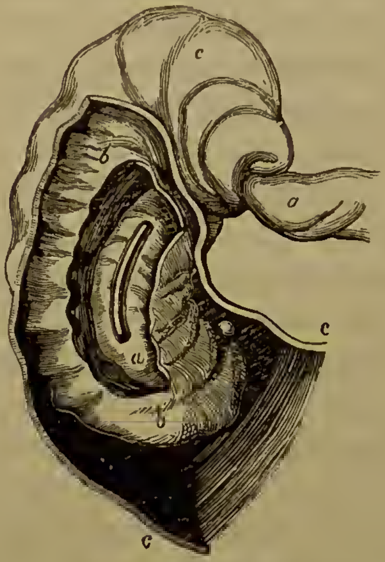
417. Perityphlitis is the name applied to inflammation of the connective tissue behind the cæcum. It usually arises from inflammation and perforation of the appendix (*appendicitis*), which is occasionally the result of concretions contained in this part of the intestinal canal. The concretions are chiefly composed of fæcal materials, or of phosphate and carbonate of lime. The inflammation in the cellular tissue may either subside, or pus may form and an abscess result (*perityphlitic abscess*). Most of the cases of fatal peritonitis originating in this part of the abdomen are also set up by perforation of the vermiform appendix.

418. Dysentery commences by acute inflammation of the mucous membrane of the colon, which appears swollen, soft and red. Subsequently the tissue sloughs, and extensive ulceration is produced. The solitary glands are affected at an early stage and give rise to circular ulcers. The lower part of the colon and the rectum are usually affected most severely. The disease is believed to arise from the presence of a parasite (*amœba coli*) which gains access to the bowel with the drinking water. In persons who have died of chronic dysentery contracted in tropical climates, the coats of the intestine are much thickened and indurated, and large portions of the mucous membrane are destroyed.

The process of ulceration is apt to be accompanied by severe bleeding from the bowel, and sometimes perforation occurs, followed by peritonitis. When dysentery has been cured, the patients are apt to suffer from constipation, arising from the constriction of the bowel caused by the healing of the ulcers, and the disease is occasionally followed by abscess of the liver.

419. In Intussusception one portion of the intestine becomes included within the part immediately below it, usually the ileum within the cæcum, and this may be again enclosed in the colon. Slight degrees of this affection are often found in persons who have died of diseases of the brain, the condition probably taking place shortly before death. Fatal cases generally occur in children. The peritoneal surface of the tumour thus produced is inflamed, and when it is laid open, the included intestine is found of a dark colour, and not infrequently gangrenous. In some rare cases sloughing takes place, and the strangulated part of the intestine is discharged by stool (see fig. 95).

Fig. 95.



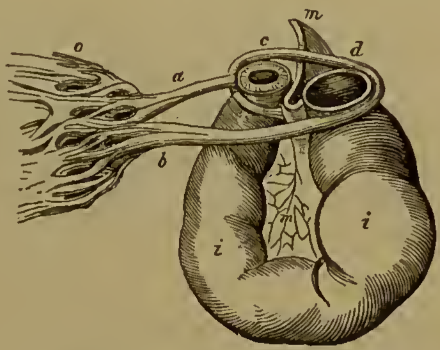
Intussusception of the small intestine. The layers of the intussusception (*a*, *b*, *c*), are cut open to show their relation; and the inner (*a*) is occupied by a bent probe, the round head of which protrudes from the terminal orifice of the layer, in contact with the inner border of the bowel. (Brinton.)

420. Obstruction of the intestine may either occur suddenly or develop in a gradual manner. The chief causes of *acute* intestinal obstruction are: (1) strangulation by bands or adhesions due to previous peritonitis; (2) intussusception; (3) volvulus, or twist of the gut; (4) impaction of a foreign body (gall-stones, &c.); (5) acute peritonitis. *Chronic* intestinal obstruction usually arises

from: (1) stricture; (2) impaction of fæces; (3) pressure of tumours upon the bowel: (4) chronic peritonitis.

421. Ulcers of the Intestine are of several kinds: (1) *Simple ulceration* is met with in the duodenum, in the appendix often associated with the presence of a concretion, and in the colon from irritation of masses of hard fæces (*stercoral* ulcer); (2) *catarrhal* ulcers chiefly occur in the large intestine, and arise from inflammation of the mucous membrane; (3) *typhoid* ulcers commence by inflammation and sloughing of Peyer's patches, and are most common in the lower end of the ileum and cæcum; (4) *tubercular* ulcers originate in the same part of the bowel, but grow in a circular form round the gut; they are usually met with in chronic phthisis; (5) *dysenteric* ulcers have already been mentioned; (6) *syphilitic* ulceration is most common in the rectum, and affects women more often than men. It arises from gummatous infiltration of the mucous membrane; (7) *cancerous* ulceration is most often encountered in the lower portion of the rectum and in the sigmoid flexure. Microscopically, it is found to present the features of the cylinder-celled epithelioma.

Fig. 96.



Loop of intestine twisted so as to be strangulated by two bands of adventitious tissue. *o*. Omentum giving origin to two bands; passing, *a*, to the free margin, *b*, to the mesentery, *m*, of a loop of intestine, *i*. Of these bands, *a* only completes the noose; *b*, strangulates the bowel in two places, *c* and *d*, the first most seriously. The bowel appears to have dropped into the noose from above. (Brinton.)

Ulcers of the intestine are apt to produce hæmorrhage by erosion of a large blood-vessel, or to perforate the coats of the bowel and set up peritonitis. Stricture of the intestine may result from their healing.

422. Stricture may occur in the small or large in-

testine, but it is much more frequent in the latter. It generally results from cancer commencing in the submucous coat, and is most commonly found in the rectum, or in the sigmoid flexure of the colon. In other cases it is produced by the cicatrisation of extensive dysenteric or syphilitic ulcerations. The intestine above a stricture becomes dilated and its muscular coat hypertrophied, whilst below the narrowing it is contracted.

The symptoms that should lead you to suspect disease of the peritoneum or intestines are: pain or tenderness of any part of the intestinal canal, swelling of the abdomen, vomiting, constipation, diarrhœa, the passing of blood or mucus by stool.

423. In every case it is necessary to inquire into the manner in which the bowels perform their functions. When constipation or diarrhœa is complained of, you should always ascertain what your patient means by the term he uses. In some persons, when in a state of health, the bowels act only once in every two or three days, in others two or three times a day. Constipation, when long continued, may produce hard swellings in the colon, which may be mistaken for morbid growths. These are most common in the cæcum and sigmoid flexure: they generally are movable, and not tender, and feel doughy when pressed by the finger (fig. 97). In cases of diarrhœa always examine the fæcal evacuations, for many patients describe as purging the frequent passing of scanty stools, resulting from constipation.

Ascertain first whether the disease has commenced suddenly or slowly. If suddenly, begin at (424); if gradually, pass on to (455).

SECTION I

Acute Disorders of the Peritoneum and Intestines

424. Inquire if the patient suffers from severe pain, and if so, commence at (425); if pain is absent, or if it is only a slight griping, pass on to (450).

If the pain is severe, observe whether it is continuous or occasional, or if it is aggravated at intervals, and inquire if the patient has had previous attacks of a similar character. In every case of severe pain try whether any part of the abdomen is tender. In some instances slight pressure is sufficient to provoke pain, in others it is necessary to apply the hand firmly before it is complained of.

425. **A. The attack has been sudden, and is attended with considerable pain.** Under this head you may have peritonitis, colic, intestinal obstruction, dysentery, typhlitis, the passage of a biliary (291) or renal calculus (242).

426. *a.* There is continuous, severe, diffused pain in the abdomen, the tenderness is intense; the abdomen is distended; the breathing is rapid (30 to 40 in a minute) and thoracic; the patient rests on his back, with the knees raised. There are frequent vomiting, a foul tongue, confined bowels, quick and wiry pulse, thirst, hot dry skin, and no appetite.

The disease is *acute peritonitis.*

The complaint occasionally commences with rigors, more generally with acute pain in some part of the abdomen, sometimes with pain and difficulty in passing urine; in either case it soon diffuses itself over the whole abdomen. It is constant and very severe, and is increased by any movement of the body or by deep inspiration, coughing, &c. Vomiting is almost always present and may occur shortly after food, or when all food has been withheld; the vomited matters may be bilious and are often of a bright green colour. The face is pale and expressive of pain and anxiety, the tongue is furred and dry, there are great thirst and loss of appetite, and the bowels are obstinately confined. The abdomen is much distended, very tender on pressure and tympanitic on percussion, but, if any effusion has taken place, there will be slight dulness in the flanks and hypogastrium. The pulse is quick, small, often hard, the temperature raised but rarely above 102°. Towards the end the face becomes pinched, the pulse rapid and flickering, cold sweats appear on the skin, and constant hiccough occurs.

The most common causes of peritonitis are injuries to the abdomen, perforation of the stomach or intestines, pyæmia, puerperal fever, disease of the kidneys, and extension of inflammation from some neighbouring organ. In *perforation*, the patient is suddenly seized with intense pain of the abdomen, attended with great faintness, and a temperature below the normal, the pulse is rapid and feeble, there is often nausea or vomiting, the countenance is anxious and sunken, the skin cold and clammy and covered with sweat.

427. The most important cases are those that result from perforation of one of the abdominal organs, as prompt treatment is generally necessary. When peritonitis follows perforation of the stomach, you usually have a history of pain after food, vomiting or hæmatemesis, but occasionally, and especially in young females, this accident takes place without any very marked symptoms preceding it. When it has been caused by ulceration of the small intestines, there is a history of typhoid fever or of diarrhœa in a person suffering from phthisis. Some of the most difficult cases are those due to perforation of the appendix, as there are often no previous symptoms, and a sudden attack of peritonitis comes on in a person apparently in perfect health.

428. Acute peritonitis may be confounded with inflammation of the bladder, rheumatism of the abdominal muscles, hysteria, enteritis and colic. In cystitis the pain is confined to the region of the bladder, and the introduction of a catheter may remove it. In rheumatism the pain is scarcely felt except on motion, the tenderness is as great on slight as on deep pressure; there is neither the fever, rapid pulse, nor the great prostration of peritonitis. In hysteria the *surface* of the skin is tender, the pain is comparatively slight, the skin cool, the pulse is not much quickened, and vomiting is absent. In colic the pain is severe but paroxysmal, there is no tenderness, on the contrary, the pain is often relieved by pressure, the pulse is not much accelerated, the temperature is normal, or only slightly elevated, the abdomen not tense or distended, and there is often a history of previous attacks of a similar character.

429. Acute peritonitis may be confined to one part of the abdominal cavity, and this is most often the case in the neighbourhood of the liver, gall-bladder, stomach or cæcum. When *local* the pain is less severe and the general symptoms are not so well marked as when the inflammation is diffused over the whole peritoneal cavity. It may lead to adhesions to the neighbouring structures or give rise to an abscess. You occasionally meet with an abscess near the gall-bladder, below the diaphragm, or in the right iliac fossa arising from this cause.

430. *b*. There is severe pain, occurring in paroxysms, near the umbilicus, usually coming on suddenly, but unaccompanied by tenderness on pressure: often vomiting of bile or mucus; bowels generally confined; pulse little affected, and no great heat of the skin or increased pulsation of the aorta. The patient often groans or screams, rolls about or presses on the abdomen to relieve the pain.

The disease is *colic*.

Colic may come on suddenly, but more generally it is preceded for some hours by nausea, griping, distension, flatulence and constipation. The pain often shifts from one part of the abdomen to another and varies in severity, intervals of comparative ease alternating with exacerbations of pain. The bowels are usually confined, but diarrhœa may precede or accompany the attack. When the pain is excessive, there may be so much depression attended with a cold skin and feeble pulse, that you may suspect that perforation of the peritoneum has occurred. The abdomen is distended, the muscles are tense and contracted, but in colic arising from lead the abdomen is more generally retracted. The passage of flatus from one part of the colon to the other can be often felt by the hand laid on the abdomen.

Many persons are subject to attacks of colic, especially those whose bowels are habitually confined; it is also one of the most common accompaniments of lead poisoning (*lead colic*), and is therefore often observed in painters, workers in lead factories, and others whose occupations bring them into frequent contact with this metal; in these cases you will find a blue line on the gums surrounding the teeth. It is also apt to follow the use of indigestible articles of food, such as pork, game, raw vegetables, &c.

431. Colic may be confounded with peritonitis (428), intestinal obstruction, the passage of biliary or urinary calculi, neuralgia of the dorsal nerves, locomotor ataxia, or hernia. It is distinguished from gall-stones, by the sudden commencement and termination of that complaint, by the pain produced by the passage of a calculus being referred to the site of the gall-bladder, by the vomiting being generally more severe, and the fluid rejected more acid than in colic, and by the attack being often followed by jaundice. The passage of a urinary calculus differs from colic in the pain affecting the back, thigh and testis, in the increased frequency of urination, in the small quantity of high-coloured, often bloody, urine that is voided during the attack, and perhaps by a history of small stones or gravel having been previously passed. Neuralgia sometimes simulates colic, but in it there are generally superficial, tender

to one-half of the body. Severe spasmodic pain of the abdomen, attended with distension, is occasionally observed in the early stages of locomotor ataxia and other spinal diseases. If the severe pain persists for some time, or returns frequently, the possibility of it arising from this cause should be borne in mind. You occasionally find severe pain in hernia, and you should in every case of colic carefully examine all the usual places for hernial protrusions.

432. *c.* The patient complains of constipation of the bowels that has resisted the action of purgatives; the abdomen is much distended, there are urgent vomiting, quick pulse, thirst, and loss of appetite. Usually at some period of the case pain in the abdomen comes on which may either be localised or of a colicky character.

The disease is *intestinal obstruction.*

The recognition of the cause producing an obstruction of the bowels is in most cases a matter of great difficulty; and as operative procedures are so frequently required, it is important, not only that the diagnosis should be correct, but that it should be determined at as early a period as possible. There are certain symptoms that, sooner or later, attend almost every case of intestinal obstruction, such as pain, vomiting, obstinate constipation, and abdominal distension. In a certain number of instances they are accompanied by a well-defined tumour and by the motions of the obstructed intestine being visible on the surface of the abdomen. In fatal cases the patient sinks from exhaustion, or from perforation of the peritoneum resulting from ulceration of the affected portion of the intestine.

433. In every case first ascertain if the patient has ever had a hernia, and let your examination of all the regions in which a hernia can present itself be most carefully conducted, remembering that a very small portion of a loop of intestine may be easily overlooked, especially if the person is stout. If there is no hernia, ascertain if he is suffering from general peritonitis, for in this disease there is also abdominal pain attended by vomiting and distension. In

peritonitis, however, the abdomen is very tender on pressure, the temperature is raised, the vomiting is not so frequent as in obstruction, there is no visible motion of the intestines, and there is often a history of gastric ulcer, gall-stones, typhoid fever, or some other condition likely to give rise to peritonitis. Especially bear in mind that appendicitis may closely simulate intestinal obstruction, and therefore carefully examine the right iliac region and the pelvis for any indications of that disease. In all cases examine the rectum, for you may find it blocked with fæces, constricted by a cancerous growth, or compressed by an ovarian or uterine tumour.

434. It will help you if you can ascertain whether the obstruction is situated in the small or in the large intestine. In the former the pain and vomiting are early symptoms, the distension is chiefly in the umbilical and hypogastric regions, whilst if the colon is the part affected, the distension is more in the flanks and epigastrium, and there is a fulness in one or both lumbar regions. In most cases, however, it is only in the early stages of the attack that these distinctions can be made out, as the abdomen soon becomes generally distended. The use of large enemata is often of use in determining this point, for if the obstruction be situated in the sigmoid flexure, as is often the case, only a small amount of fluid can be introduced. Be cautious in the use of enemata if the case has lasted for some time, as there is a liability of perforation being produced by the injection of a large amount of liquid.

First ascertain if the attack has commenced suddenly, if so begin at (435): if it has been preceded by increasing constipation or other signs of ill-health, pass on to (440).

435. *The symptoms have come on suddenly.* The obstruction may have arisen from constriction by bands or internal herniæ, from volvulus, intussusception, or from the intestine having become occluded by a gall-stone.

436. *Internal Strangulation* is most common in males

between fifteen and thirty years of age: it sometimes follows strains or sudden efforts, or it may occur without apparent cause. The obstruction is usually in the small intestine and in the lower part of the abdomen; pain is an early symptom, and is quickly followed by vomiting, the vomited material is often stercoraceous at a comparatively early period of the case. Distension soon presents itself, but a tumour can be rarely discovered. The symptoms are the same whether the obstruction has been caused by strangulation or by an internal opening.

437. *Volvulus* is most common in the large intestine, and especially at the sigmoid flexure and the cæcum. It is usually met with in elderly people, but it may occur at any age. There is often a history of long-continued constipation. Pain is severe, vomiting and distension come on quickly. No definite tumour can be discovered.

438. *Intussusception* is most common in the ileo-cæcal region, especially in children, but it also occurs in adults in the small intestine. Pain and vomiting occur early. The attack is sometimes preceded by diarrhœa, and in the majority of cases it is accompanied by the passage of blood or blood-stained mucus; sometimes tenesmus is a prominent symptom. In a large proportion of cases an elongated tumour can be discovered in the lower part of the abdomen, or can be found by rectal examination. In rare instances, a portion of the included bowel protrudes from the rectum.

439. *Obstruction by a gall-stone* is most common in females and rarely takes place under forty-five years of age. There is usually a history of previous attacks of biliary colic and jaundice. Pain and vomiting come on early and the case often runs a rapid course, either from the obstruction or from peritoneal perforation. No tumour can be discovered.

440. *The attack has been preceded by gradually increasing constipation.* You may have stricture of the intestine, twisting by adhesions, or fæcal impaction.

441. *Stricture* is most common in the large intestine, the

sigmoid flexure or the upper part of the rectum being generally involved. The patient is usually of middle or advanced age. He has generally lost flesh and strength for some time before the attack. Pain and vomiting are not such early symptoms as in acute cases, and distension rarely comes on until the obstruction has lasted for some days. A tumour can be often discovered in the abdomen, and the peristaltic movements of the intestines are frequently visible.

442. When the obstruction arises from *twisting of the intestines* by extensive peritoneal adhesions there is often a history of tubercular or cancerous peritonitis. The symptoms come on slowly, the pain is often severe, but vomiting and distension are usually late symptoms.

443. Obstruction from *fæcal accumulation* may occur at any age, but is most generally met with in the old; there is a history of long-standing constipation, and often of previous attacks of obstruction. Pain is rarely severe, and vomiting only comes on at a late period. A tumour may often be discovered in the abdomen, or the rectum may be found to be blocked with fæces.

444. *d.* There is griping pain of the abdomen with some tenderness in the region of the colon; frequent desire to go to stool, attended with straining and the passage of blood or mucus, mixed with small lumps of fæcal matter (*scybala*). The patient is restless, has a furred tongue and thirst, the skin is cool, the pulse small, but not much quickened.

The disease is *dysentery*.

This disease is common in hot climates, but it occurs also occasionally in this country. It is often preceded by nausea and vomiting, but the attack is usually ushered in by chilliness, a moderate elevation of temperature, general feeling of weakness and depression, and by diarrhœa. There are griping pains of the abdomen and slight tenderness on pressure. There is constant desire to evacuate the bowels, and the stools are composed of small quantities of mucus stained with blood. The patient's strength fails, the pulse becomes rapid, but the temperature is but little raised. In case of recovery there is a gradual amelioration of all the symptoms and improvement may proceed without interruption. When a fatal termination is imminent the abdomen becomes tender, the pulse rapid and feeble, the tongue dry, red, and glazed, the stools are passed involuntarily, and are of a greenish colour, very fœtid, or like washings of raw meat. In some cases severe hæmorrhage occurs from a large artery being opened by the ulceration, in others (chiefly in tropical dysentery) abscess of the liver develops, or fatal peritonitis is set up by perforation of the walls of the intestine.

In this country we generally meet with dysentery as a chronic disease and as the result of an acute attack contracted in a tropical climate. The patient is emaciated, pale, and exhausted, and the disease is associated with chronic diarrhœa. The symptoms not infrequently become aggravated, either by exposure to cold or from an improper diet, the diarrhœa increases, the stools are mixed with mucus, there is an increase of abdominal pain and tenderness, and in some cases an obscure sensation of thickening can be detected over some parts of the colon.

Amœbæ have been found in the stools as well as in the colon in cases of tropical dysentery.

445. You may confuse dysentery with piles, morbid growths, or cancer of the colon or rectum, but a careful examination of the gut with the finger or bougie will prevent such an error. It is distinguished from simple diarrhœa by the constant straining, the severe pain, and the character of the stools.

446. *e.* The patient complains of a continuous, dull pain in the right iliac region, increased on pressure or motion; a tumour can be felt in this situation, which is rather dull on percussion, but its borders are tympanitic. The bowels are usually confined, the pulse is quickened, and there are thirst, deficient appetite, and sometimes vomiting.

The complaint is *typhlitis*.

Many authors are in the habit of referring all acute swellings connected with the cæcum to an affection of the appendix vermiformis. There is, however, little doubt that inflammation of the cæcum and ascending colon may occur without implication of the appendix, for tumours of this kind are occasionally met with in other parts of the large intestine, and the course and symptoms of typhlitis differ greatly from those of appendicitis.

Typhlitis is in some cases preceded for a few days by obstinate constipation and pain of the abdomen; in others it is ushered in by a chill followed by pain. Nausea and vomiting are often present, the tongue is furred, and the bowels are confined. There is a well-marked, elongated tumour in the region of the cæcum and ascending colon, which is tender on pressure and is dull on percussion. The pain is increased by any movement of the body. The pulse is somewhat quickened, and the temperature moderately elevated. The disease is most common in young persons, and usually terminates favourably.

447. Typhlitis may be confounded with cancer of the cæcum, but the former is usually met with in the young, the latter in persons of middle or advanced life. The temperature is somewhat raised in typhlitis, it is normal or subnormal in cancer; the tumour is larger, more tender and more regular in its outline in typhlitis than in malignant disease. In inflammation of the cæcum the swelling soon subsides, whilst in cancer it persists and gradually increases in size.

448. *f.* The patient is suddenly attacked with pain in the right iliac region, the bowels are confined, the pulse quick, the temperature elevated. There is increased resistance, or a tumour in the iliac region which is tender on pressure.

The disease is *perityphlitis.*

The complaint is usually caused by inflammation or ulceration of the appendix vermiformis (*appendicitis*), although it occasionally arises from other conditions. Appendicitis is most common in males between the ages of fifteen and thirty, but it may occur at any period of life. The symptoms may slowly subside, and the appendix may become united to the neighbouring parts by adhesions.

If perforation of the appendix takes place suddenly, general peritonitis is set up; severe abdominal pain, tenderness on pressure, vomiting, constipation, and the other symptoms of this condition present themselves. The tenderness is, however, most intense in the right iliac region, and often comparative dulness on percussion and a sense of increased resistance can be detected in that part. The tenderness is often most marked at the outer edge of the rectus muscle on a line drawn from the umbilicus to the anterior superior spine of the ileum. This is known as *McBurney's point.* In most cases a soft tumour, formed by the adhesion of one or more coils of small intestine, can be discovered on examination by the rectum at the right side of the brim of the pelvis. In some instances percussion elicits a gurgling sound in the right iliac region.

When *an abscess* has followed ulceration of the appendix, an ill-defined, painful swelling presents itself in the right iliac region. The thigh is often flexed on the abdomen, the pulse is rapid, and the temperature of the hectic type. In some instances it is difficult, or impossible, to determine the existence of the abscess when the pus lies behind the cæcum. In other cases, the pus burrows upwards in the connective tissue in the loins, so that no tumour can be found in front. There is, however, tenderness over the right loin, dulness on percussion between the last rib and the upper border of the ilium, and in some instances the presence of air and liquid can be determined by palpation or percussion.

449. In some cases of tubercular peritonitis the pain and tenderness are so localised that the disease may simulate appendicitis, but the onset is more gradual, the general condition of the patient less alarming, the pulse not so quick, and the temperature less elevated. In addition to these, there is no tumour, either in the iliac fossa or at the brim of the pelvis, and there is less tenderness on pressure.

TABLE OF SYMPTOMS AND PHYSICAL SIGNS OF THE CHIEF ACUTE DISEASES OF THE ABDOMEN

	General Peritonitis.	Appendicitis without General Peritonitis.	Colic.
Pain	Intense, continuous, increased by movement	Severe in right iliac fossa	Severe, spasmodic, shifting its position
Tenderness	Extreme and general	Confined to right iliac fossa	None, pain often relieved by pressure
Vomiting	Frequent	Occasional, may be absent	Occasional, often absent
Bowels	Obstinately confined	Confined or loose	Confined
Fever	Temperature elevated	Temperature elevated, rarely high	Temperature normal
Pulse	Rapid, small, wiry	Usually quick	Rarely accelerated
Tumour	Abdomen much distended, tense and tympanitic	Fulness with increased resistance above Poupart's ligament	Abdomen not much distended
Position of patient	Both thighs flexed	Right thigh flexed	Patient usually restless, legs not flexed

450. **B. The attack has been sudden, but it is not attended with much pain.**

You have under this head, Asiatic cholera, simple cholera, and acute diarrhœa.

451. *a.* The patient is affected with constant vomiting and diarrhœa, at first of bilious, afterwards of watery

("rice-water") stools. The face is blue and cadaverous, voice whispering, skin and breath cold, urinary secretion suppressed, pulse exceedingly feeble or imperceptible, but the intellect remains clear. He suffers from violent cramps in the extremities.

The disease is *Asiatic cholera.*

This complaint only occurs in temperate climates as an epidemic, and when once seen can never be forgotten. The patient is usually attacked during the night, or early morning, with a feeling of oppression, nausea, or vomiting, followed by severe diarrhœa. The diarrhœa quickly increases, but there is no pain, and the patient often expresses himself relieved by the free action of the bowels. Vomiting comes on, and after the contents of the stomach have been evacuated, the fluid rejected presents the same serous appearance as the stools; the thirst is intense, the urine scanty, the pulse small and feeble, rarely above 120, temperature below the normal; there is great muscular prostration, and agonising cramps affect the limbs. The abdomen is retracted, and there is no marked tenderness on pressure. In unfavourable cases the vomiting and diarrhœa continue, the strength of the patient rapidly fails, the skin is blue, cold, and covered with sweat, the pulse becomes imperceptible, the breath cold, and the patient sinks from exhaustion. If the stage of collapse be overcome the patient not infrequently falls into a typhoid condition which often proves fatal. In favourable cases, the diarrhœa and vomiting subside, the temperature of the skin rises, the pulse improves, and a general amelioration of all the symptoms is observed.

In every epidemic of Asiatic cholera a number of cases present themselves in which there is only a moderate amount of diarrhœa, with nausea and loss of appetite, but without collapse. These are often described as *Cholerine.*

Asiatic cholera is believed to be the result of the action of a micro-organism which can be discovered in the stools of the persons affected with the disease.

452. *b.* The patient suffers from constant vomiting and diarrhœa with bilious or pale, watery stools, usually preceded, or attended, by griping pain of the abdomen and severe cramps of the extremities. The pulse is feeble, the voice husky, and there are great thirst and depression.

The disease is *simple cholera.* (*Cholera Nostras.*)

The disease consists of inflammation of the mucous membrane of the intestinal canal. It often proves fatal to children, but recovery usually occurs in adults. In infants it is most liable to occur in the hot months of the year, and chiefly attacks those who are fed with artificial food; in adults it is usually the result of indigestible or irritating articles of diet. It commences suddenly, and is ushered in with griping pains and diarrhœa, but in severe cases there is a considerable diminution of temperature, attended by a small, feeble pulse, and great depression of strength.

453. It differs from Asiatic cholera by not occurring as an epidemic, being accompanied by griping pains, the stools not presenting the rice-water appearance, the collapse, when it occurs, being less severe, and by adult patients usually recovering.

454. *c.* The patient suffers from diarrhœa, without vomiting, generally attended with some griping pain. There are often thirst and deficient appetite, but no fever and not much depression.

The disease is *diarrhœa.*

You generally find that diarrhœa is produced by indigestible food; in some cases the stools consist almost entirely of bile.

SECTION II

CHRONIC DISEASES OF THE PERITONEUM AND INTESTINES

First inquire if there is severe pain, and if so, begin at (455); if not, pass on to (461).

455. **A. The patient suffers from severe pain.**

Under this head you may meet with chronic peritonitis, cancer of the peritoneum and chronic dysentery (444).

456. *a.* The patient has pain, tenderness, and distension of the abdomen, which is tympanitic on percussion, sometimes with intervening portions of dulness, and retains its shape when the body is moved from side to side; the bowels are usually purged, the pulse is quick and feeble, the skin hot, appetite bad, and thirst and emaciation are present.

The disease is *chronic peritonitis.*

Chronic peritonitis sometimes follows acute peritonitis, or it may be produced by an injury to the abdomen. It is more frequently the result of tubercular or cancerous growths.

Tubercular peritonitis may present itself in an acute, or in a chronic form.

457. In the *acute form* the patient complains of pain in the abdomen, loss of appetite, thirst, and diarrhœa. The stools are often of a yellow colour, like those of typhoid. There is a well-marked rise of temperature, and a quick pulse. The abdomen is swollen and usually tender on pressure over different portions. At a late period of the case consolidation of the lungs can be generally detected. This form is most liable to be confounded with typhoid fever. In tubercular peritonitis the onset is usually more sudden than in typhoid, there is more pain and tenderness of the abdomen, the diarrhœa is less continuous, often alternating with constipation, the temperature is more variable, and the spots are absent.

458. *Chronic tubercular peritonitis* commences insidiously, and at first there is little or no pain, but the patient loses flesh, appetite, and strength. Thirst is usually present, the temperature is elevated and of the hectic type. The abdomen is at first much distended, the percussion note is tympanitic, but afterwards effusion may be detected in the flanks and hypogastrium. When adhesions take place the abdomen retains its shape in every position of the body,

and in some cases it is uniformly retracted. Chronic tubercular peritonitis is most frequent in children, and the pain and tenderness are in some cases but slight. It is often accompanied by enlargement of the mesenteric glands, but these very rarely form a tumour capable of being distinguished during life.

459. *Cancerous peritonitis* occurs in two principal forms. In one considerable tumours can be detected; in the other there is great contraction of the peritoneum without perceptible tumours. In both there is often but little pain at an early period, but it gradually comes on as the disease progresses and, towards the end of the case, is usually constant and severe. In the first form there is rapid loss of flesh and strength, the temperature is normal, or subnormal, the pulse feeble, but not quickened. Effusion of fluid almost always presents itself, which may prevent the tumours being discovered until it is removed by tapping. In the female a malignant growth is commonly to be found in the pelvis. In the second form there is often loss of flesh and strength unaccompanied by pain. As the case proceeds pain of the abdomen usually presents itself, accompanied by attacks of vomiting. Afterwards, ascites becomes a prominent symptom, but it will be then remarked that the whole abdomen is dull on percussion, the umbilical region which, in an ordinary case of ascites, affords a tympanitic note, having lost its resonance. In both forms of peritoneal cancer the progress of the case is rapid, and the termination invariably fatal.

460. It is often very difficult to distinguish tubercular peritonitis from that caused by cancer. Tubercular disease occurs more often in the young, cancer in those who are of middle or advanced life. In the former the temperature is elevated, the pulse quickened, the progress comparatively slow; in the latter the temperature is normal or subnormal, and the progress rapid. In cancer of the peritoneum, ascites is more general and better marked, tumours, when they are present, are harder, more defined, and more

numerous than in tubercular disease, and can be generally detected in the pelvis. In tubercular cases there is usually a co-existing affection of the lungs or pleuræ, while in cancer you may constantly detect indications of malignant disease in the stomach, breast or liver.

461. **B. The patient does not suffer from severe pain.** You may have constipation, chronic diarrhœa and mucous colitis under this head.

462. Amongst the usual causes of constipation are want of exercise, improper food, lead poisoning, atony of the colon, affections of the brain, stricture of some portion of the large intestine. In all cases it is apt to give rise to flatulence and other signs of indigestion, palpitation, dyspnœa, giddiness, headache, heaviness after meals, coldness of the hands and feet, and inability for much mental or bodily exertion.

463. You will frequently meet with cases of chronic diarrhœa, and the diagnosis of the causes producing it is often a matter of considerable difficulty. Be careful to inquire as to the number and character of the evacuations, and in any doubtful case examine the stools yourself.

Some persons are liable to frequent and irregular actions of the bowels from any mental excitement, but as these attacks are only occasional the general health is not affected. In other instances a frequent action of the bowels is the result of cancer of the rectum, but the evacuations consist, not of feculent matter, but of blood and mucus. An examination by the rectum will enable you to detect any narrowing of the gut that is within reach of the finger.

464. Diarrhœa is not an infrequent accompaniment of chronic Bright's disease, cirrhosis or chronic congestion of the liver, and of dilatation of the heart, so that in every chronic case it will be necessary for you to ascertain that such diseases are absent before you can arrive at a correct diagnosis.

465. Chronic diarrhœa is a common result of dysentery

contracted in a tropical climate, but you will readily recognise such cases by the history of the commencement of the illness. A form of chronic inflammation, usually attended with ulceration of the colon, occasionally presents itself in this country, in which constant diarrhœa is the prominent symptom. It is attended with gradual loss of flesh and strength, and the patient in unfavourable cases either sinks from exhaustion, or is cut off by hæmorrhage or by perforation of the peritoneum. These cases of chronic colitis present the same morbid appearances as are met with in chronic dysentery.

466. One of the most common causes of persistent diarrhœa is tubercular ulceration of the small intestines occurring in the early stages of phthisis. In such cases the cough and expectoration may be slight or even absent, and you can only arrive at a correct diagnosis by a careful examination of the chest.

467. Chronic diarrhœa, alternating usually with constipation, is not of infrequent occurrence in persons predisposed to gout and rheumatism. The disease is often very rebellious to treatment, and as it subsides it may be replaced by an affection of the joints.

468. *a.* The patient, who is almost always a female, passes in the stools portions of membrane or casts of the lower part of the colon, composed of mucus. She suffers from flatulence and other signs of indigestion, and the bowels are usually confined.

The disease is *mucous colitis.*

There is rarely much pain, but in some cases the action of the bowels is preceded by griping and is followed by a sensation of faintness. There is often tenderness on pressure over the colon. In some instances nausea and loss of appetite are prominent symptoms, and the patient is weak and desponding in mind. The passage of the mucus often intermits for weeks at a time, in others it occurs every few days. The general health is often good in the intervals of the attacks.

CHAPTER XI

ABDOMINAL TUMOURS

469. BEFORE entering on the diagnosis of tumours of the abdomen, it is necessary that you should make yourself acquainted with the various morbid changes to which the abdominal organs are liable, and the signs by which these changes may be recognised. Observe if the enlargement of which the patient complains is general and uniform (470), or is confined to one part of the abdomen (482).

SECTION I

THERE IS A GENERAL AND UNIFORM ENLARGEMENT OF THE ABDOMEN

470. The enlargement may be produced by an abnormal amount of air in the stomach or intestines, by fluid in the peritoneal cavity, or by a solid tumour.

471. Commence by percussing the whole of the abdomen: if you find the sound everywhere *tympanitic*, the swelling arises from an accumulation of air; if a *dull* sound is elicited, over the whole or part of the abdomen, you have to deal either with fluid or with a solid tumour. You distinguish the presence of fluid in the following manner: Place the left hand over a dull portion, and with the fingers of the right tap rather sharply over another dull part; if fluid is present the impulse of the

blow will be felt by your left hand. It is easy to detect fluctuation if the peritoneal cavity is filled with fluid, but when this exists only in a small quantity you must adopt the following method of examination: Let the patient rest upon one side, whilst you percuss the opposite side of the abdomen, where you will probably find a clear resonance. Make him now reverse his position, and if fluid is present, you will elicit a dull sound where before it was tympanitic. If you are unable to feel fluctuation, and the swelling is firm and resistant, you have to deal with a solid tumour.

472. *a.* The abdomen is generally and uniformly enlarged, and the sound on percussion everywhere tympanitic.

The enlargement is caused by *an excessive amount of air in the intestines* (*tympanites*).

Tympanites is rarely attended with pain or tenderness unless it is the result of acute or chronic peritonitis. There is, however, a feeling of fulness and discomfort, increased after food. It is often accompanied by dyspnœa from the pushing upwards of the diaphragm, and in many instances by palpitation.

Extreme flatulent distension sometimes results from atony of the colon, chronic peritonitis, or intestinal obstruction. In the first the bowels are confined and the patient is liable to colic, but there is neither fever nor emaciation. Extreme distension from this cause frequently occurs in attacks of hysteria, and is exaggerated by the protrusion of the abdomen by the patient. Chronic peritonitis usually arises from tubercular disease; the abdomen is tender upon pressure, there are loss of strength and flesh, diarrhœa, a quick pulse, thirst, and in most cases some evidence of disease of the lungs. In some instances, and especially in adults, distension of the abdomen is the first symptom that attracts notice, and may be unaccompanied by either pain, tenderness or fever. When the distension is produced by intestinal obstruction you have the other symptoms of this condition to guide your diagnosis (432). Flatulent distension is a common symptom of intestinal dyspepsia, and is often very distressing, especially when the patient is stout. Tympanites is generally associated with a loud gurgling of gas in the large intestine.

473. You must not forget that a largely dilated stomach may also cause distension of the abdomen and afford a tympanitic note on percussion. But in such cases there is always some accompanying dulness in the flanks or hypogastrium from the presence of fluid in the stomach, and you have the other symptoms of that affection to direct you (411).

474. In cases of perforation of the stomach or intestines there may be great distension from the accumulation of air in the peritoneal cavity. There are no visible motions of the intestines, and the normal dulness in the anterior hepatic region is absent, on account of the liver being pushed backwards by the presence of air in the peritoneum. If, however, only a small amount of gas has escaped, the latter sign may not be present.

475. *b.* The abdomen is generally and uniformly enlarged, the sound on percussion is dull, and fluctuation can be detected.

There is *fluid in the abdominal cavity* (*ascites*).

Pain and tenderness are usually absent in ascites, but there is a sense of discomfort and uneasiness from the collection of fluid in the peritoneal cavity. Dyspnœa arises from the pushing upwards of the diaphragm. The abdomen is uniformly distended, and as the patient rests upon the back, the flanks appear to bulge outwards. The superficial veins are enlarged, but this varies in extent according to the cause producing the dropsy. On measurement, the greatest width is at the umbilicus. Fluctuation can be distinguished in all parts of the abdomen, and on examination by the rectum a sensation of fluid can be perceived at the brim of the pelvis. In the female the uterus is depressed. If a portion of the fluid is removed by an aspirator, it is found to be clear, and to contain albumen.

As the patient rests on his back, there is a tympanitic note on percussion in the umbilical and epigastric regions, the line of which varies with his position.

The usual causes of ascites are, diseases of the liver, heart, or kidneys, chronic tubercular peritonitis, and cancer of the peritoneum.

476. Diseases of the liver are the most common causes of ascites, on account of the obstruction to the portal circulation they produce. This is generally the result of cirrhosis, the presence of which must be determined by the enlargement of the superficial abdominal veins, the emaciation of the patient, and the other symptoms of that disease (318). Ascites may also be produced by cancer of the liver, and more rarely by lardaceous degeneration; it also arises from chronic congestion, especially when this results from disease of the heart or lungs; it is not an accompaniment of hydatids, fatty liver, or hepatic abscess.

477. The superficial veins of the abdomen may remain vastly enlarged after a patient has recovered from disease of the liver or some other condition that has compressed the portal vein. Ascites readily takes place in such cases, and the diagnosis must be determined by the history of the illness that first affected the portal circulation.

478. Dilatation of the heart or diseased mitral valve frequently gives rise to ascites. In these cases œdema of the feet precedes the abdominal dropsy, and the patient has previously suffered from cough, dyspnœa, and palpitation. Ascites produced by kidney disease is usually associated with œdema of the limbs and face, and effusion into the pleura or pericardium. The state of the urine will enable you to decide as to the nature of the affection (220).

You may mistake for ascites ovarian dropsy, a greatly distended bladder, a large hydatid cyst, or a gravid uterus.

479. In ovarian dropsy the swelling is first observed in the lower part of the abdomen, and gradually extends upwards; and the physical signs of diseases likely to produce ascites, such as affections of the heart, liver or kidneys, are usually

absent. In ovarian disease the abdomen usually projects forwards, whilst there is less bulging in the flanks than in ascites. The superficial veins are less distended. Fluctuation is less distinct, and the sensation varies in different parts. An examination by the vagina shows that the uterus is raised, and a feeling of resistance or the lower end of the tumour can be usually distinguished. The fluid removed by aspiration is thick, glairy, and often high coloured. When the patient lies upon her back the front part of the abdomen is quite dull on percussion, whilst you have a clear sound at the flanks, because the fluid being contained in the cyst does not gravitate.

480. In dilated bladder the swelling may reach to or above the umbilicus, so that there is a large elastic tumour, in which you may detect fluctuation and dulness on percussion. There is, however, a frequent desire to pass water, which is pale and of low specific gravity; and the introduction of a catheter will remove all chance of a mistake.

481. Occasionally a very large hydatid cyst closely simulates ascites. There is, however, a history of a gradual increase of the abdominal distension without pain or tenderness. The line of dulness does not vary with the position of the patient, and the fluid removed by aspiration will be found to be clear, to contain chlorides without albumen, and under the microscope will generally show shreds of hydatid membrane or portions of echinococci.

It is merely necessary to mention that a gravid uterus has been mistaken for ascites, but with ordinary care such an error is not likely to be made even by a junior student.

SECTION II

The Tumour is Confined to One Part of the Abdomen

482. Nothing but careful and repeated examinations can prevent you from making mistakes in the diagnosis of

tumours of this class. In some persons, especially in women, the recti muscles are apt to contract on the application of the hand, and thus give the semblance of a tumour when none exists. When you suspect this to be the case, you must examine the patient in different positions, relaxing the muscles as much as possible, and meanwhile

FIG. 97.

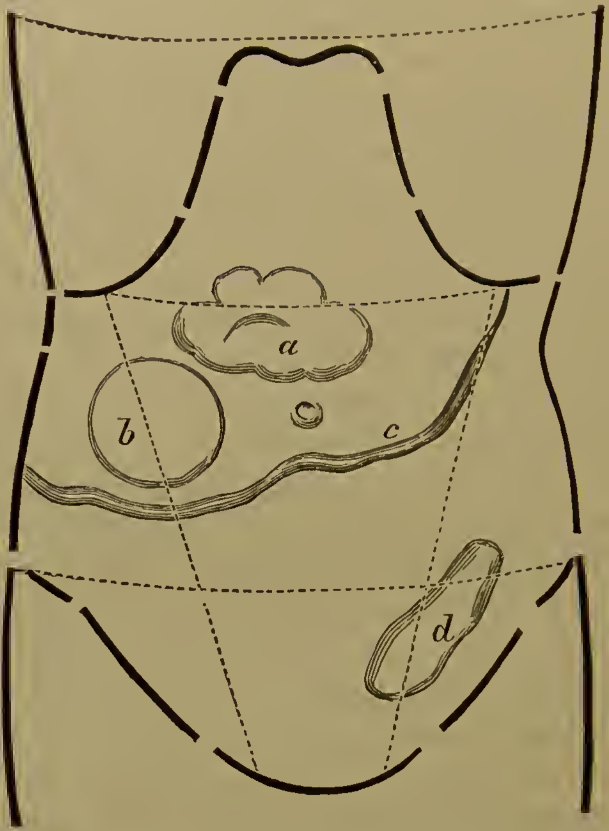


Diagram representing the situations of tumours in four different cases of fæculent accumulations in the large intestine. *a.* A nodulated enlargement, existing for many weeks, from fæces in the arch of the colon. *b.* A round tumour, continuing and slowly increasing for many months, from fæces in the ascending colon. *c.* Extensive hardness occupying the whole space included within the double line to the scrobiculus cordis; chiefly depending on large accumulation of fæces in the colon. *d.* Tumour from recent fæculent accumulation in the sigmoid flexure of the colon.

(BRIGHT.)

engaging her in conversation. The abdominal muscles may be relaxed by placing the patient on the back, with the shoulders somewhat raised and the back of the head propped up until the chin falls on the top of the sternum; the knees should be bent on the abdomen and supported by an assistant, whilst the feet rest on their soles. In some cases, though very rarely, it is necessary to use an anæsthetic before you can arrive at a positive conclusion.

483. Fæcal accumulations sometimes simulate malignant and other tumours; they feel soft and doughy, and are often situated in the cæcum or sigmoid flexure of the colon. In all doubtful cases the bowels should be emptied, either by a purgative or by enemata, before a positive diagnosis is given. The accompanying diagram shows the usual situation of these tumours (see fig. 97).

484. The presence of an abdominal tumour is often obscured by ascites. When fluid exists in large quantity in the peritoneum, it may be impossible to determine the existence of a tumour until after tapping has been performed; but where there is only a moderate amount of liquid you can often reach the solid mass by suddenly and forcibly pressing the tips of the fingers on the abdomen, so as to displace the intervening layer of fluid.

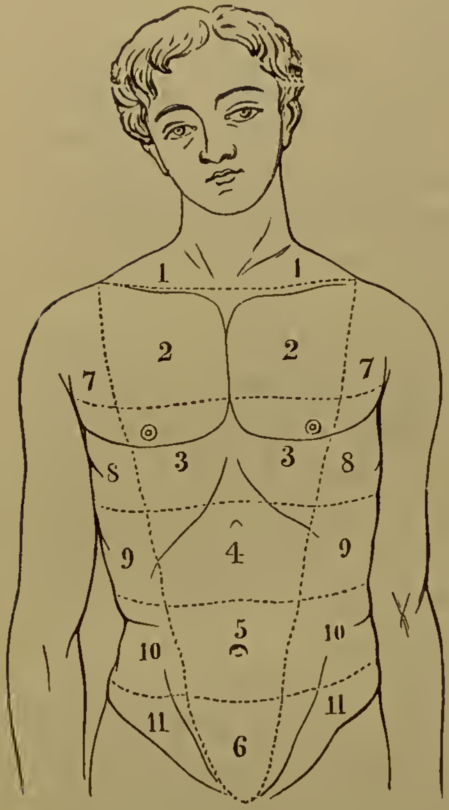
485. When you have satisfactorily determined the presence of an abdominal tumour, consider what organs occupy the region in which it is placed, and try to trace its connection with one of them. Thus, if it be situated in the right hypochondrium, mark out the liver, and ascertain if there is any connection between this organ and the morbid growth.

486. Observe whether the tumour is fixed or moves during respiration; if it moves, you know that it is either connected with the diaphragm or with some organ that is depressed during inspiration, such as the liver, stomach, spleen, omentum or intestine. If it is fixed, it may be an enlargement of some structure, such as the kidney, aorta, or a lymphatic gland, which is permanently retained in its

position, or it may be connected with a movable organ that has become fixed by adhesions.

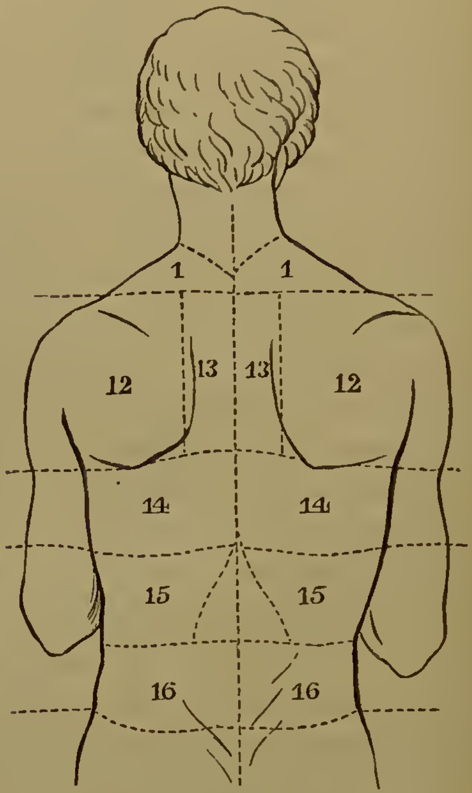
487. Pay especial attention to the state of any of the abdominal organs whose functions are disordered. Thus, if the patient has suffered from frequent vomiting of a large quantity of fermenting liquid, and the stomach is found to be enlarged, you would look upon a hard tumour as being connected with the pylorus, although it might be far removed from the normal position of that part.

FIG. 98.



4. Epigastric. 5. Umbilical. 6. Hypogastric. 9. Hypochondriac (right and left). 10. Iliac (right and left). 11. Inguinal (right and left).

FIG. 99.



15. Inferior dorsal (right and left). 16. Lumbar (right and left).

488. The abdomen is divided into regions in the same

manner as the chest; a glance at fig. 98 and fig. 99 will make you acquainted with them.

489. RIGHT HYPOCHONDRIUM.—*Tumours of the liver, kidney, and gall-bladder are most generally found in this locality.*

490. There are a number of different diseases of the liver that may give rise to an abdominal tumour. The enlargement is uniform in acute and chronic congestion, in obstruction of the common bile duct, in lardaceous and fatty degenerations, in leuchæmia, and in Hodgkin's disease. It is irregular in shape in abscess, cirrhosis, syphilitic tumour, in cancer, and in hydatid cysts. The liver, when enlarged, usually occupies only the right hypochondrium and epigastrium; but when affected by lardaceous disease or cancer it may extend downwards and fill a large portion of the abdominal cavity.

491. The best method of examination is to place the patient on his left side, with the back well supported by a pillow, whilst he inspires as fully as he is able, in order to depress the organ. Remember that the liver may seem to be unduly large from being pushed downwards by a collection of fluid in the pleura, emphysema of the lungs, an enlarged heart or an aortic aneurism. You must first ascertain that none of these are present.

492. In many cases of enlarged liver the external abdominal veins are very much increased in size from the pressure on the portal circulation, and the right hypochondrium and the epigastrium present a distinct bulging arising from the increased bulk of the organ. Sometimes this is better seen in the erect than in the recumbent position. Occasionally the tumour pulsates, either from its being situated over the aorta or from disease of the heart producing general dilatation of its veins (308). Mark out the upper border of the liver both before and behind by percussion, and continue the percussion carefully downwards until you reach the tym-

panitic note afforded by the stomach or colon. As the enlargements of the liver are always superficial, any tympanitic note between its lower edge and the tumour would lead you to doubt its being hepatic.

493. Tumours of the liver differ greatly as to the sensation of hardness they communicate to the finger. In lardaceous disease, cirrhosis and syphilitic disease they feel firm; in fatty degeneration soft and yielding; in hydatid cyst they are elastic. Always examine carefully the lower edge of an enlarged liver, and, if possible, insinuate the tips of your fingers below it. It is nodular in cancer, cirrhosis and syphilitic disease, hard in lardaceous, and rounded in fatty degeneration. Remember that the liver moves readily with the respiration, unless there are adhesions, which are most common in abscess, cirrhosis and cancer. In cirrhosis it is not uncommon to meet with a well-marked friction sound over the seat of the tumour.

There is rarely much difficulty in the diagnosis of the *uniform* enlargements of the liver, as the organ can be traced by the finger along its lower edge, and the dulness on percussion is continuous throughout the whole area occupied by the tumour.

494. Mistakes are most likely to occur when the tumour is situated at the borders of the organ. You may meet with the liver below the ribs without any apparent cause for enlargement. In such a case you must percuss carefully along the upper border, and you may find a curved line of dulness in the front, or dulness and feeble respiration behind, from compression of the lung by an abscess or hydatid tumour. These are apt to burst into the pleura or through the lungs, and this is generally preceded by a friction sound over the lower part of the right chest.

495. When a tumour is situated at the lower border there may be a difficulty in distinguishing between one connected with the liver and a movable kidney, as both move with the respiration. A tumour of the liver is, however, rarely of the elongated shape of a kidney; and

it is superficial, so that a tympanitic note cannot be heard in front. A hepatic tumour ascends and descends with the respiration, whilst a movable kidney slips up under the edge of the liver, and can be maintained in its position during expiration by the pressure of the finger. In syphilitic liver a projection can be generally traced to the main body of the organ, but occasionally you will meet with deeply placed tender tumours, which give you the impression that they are not connected with it. In such cases the swelling is usually painful and tender, the temperature rises every evening, and a course of iodide of potassium seldom fails to relieve the patient. There is sometimes considerable difficulty in determining whether a tumour in the left hypochondrium is connected with the liver or the spleen. You may, however, with care usually trace the lower border of the liver to the edge of the tumour, whilst in the case of the spleen the notches in its anterior border and the accompanying changes in the blood will help the diagnosis.

(For differential diagnosis of the different enlargements of liver, see 316.)

496. There are two forms of tumour connected with the gall-bladder, and they differ in the physical signs by which they can be recognised. That produced by distension, resulting from an obstruction in the cystic or common duct, presents itself as a tumour in the site of the gall-bladder or extending towards the navel. It moves with the respiration, unless it has become fixed by adhesions. Being superficial, the note on percussion is dull, but there is often a clear resonance between it and the lower border of the liver. It feels elastic, but is rarely very tense; its surface is smooth, and the edge often ill-defined. Its shape is usually said to be like a pear, but in some cases where the cystic duct has been obstructed for a length of time it is large and globular. When the obstruction is situated in the common duct, as in cancer of the pancreas,

there is jaundice, but the swelling rarely attains to a very large size.

497. On account of its elasticity a dilated gall-bladder is most likely to be confounded with a hydatid cyst. It is, however, less tense, and is usually of smaller size than a hydatid ; it is often accompanied by slight pain and tenderness, is almost always preceded by attacks of biliary colic and sometimes attended by jaundice. When suppuration has taken place in a dilated gall-bladder, the patient suffers from severe pain in the part; there is tenderness on pressure, rigors are apt to occur, the temperature is considerably raised, and is of a remittent character.

498. In primary cancer of the gall-bladder, which is, however, very rare, there is a considerable swelling in the right hypochondrium, which may be visible. It at first moves with respiration, but soon becomes fixed by adhesions. The percussion note over it is dull, the surface is hard and nodular ; it often compresses the duodenum, producing dilatation of the stomach and its accompanying symptoms (411). In addition to these, there is always the debility, rapid emaciation and loss of appetite that accompany malignant disease of any of the abdominal organs.

499. It is easy to confound cancer of the gall-bladder with malignant disease of the stomach. The tumour in the former is, however, usually of a more globular shape; it is commonly preceded by attacks of biliary colic, the tumour is more superficial, and there is an absence of pain after food and of vomiting of "coffee ground" materials.

500. EPIGASTRIUM.—*Tumours situated in this region are usually connected with the stomach.*

501. Abdominal tumours produced by diseases of the stomach may present themselves under three forms : dilatation of the stomach, thickening of one part of the gastric wall, and a general thickening of the whole organ.

502. In dilatation the tumour may occupy, to a greater or less extent, the whole of the abdomen below the navel (fig. 94), the left side usually bulging more than the right and the epigastrium being somewhat depressed. In most instances a slow, peristaltic action is visible, each part of the swelling in turn presenting an elevation followed by a corresponding depression. The movement is from the left to the right side. When the patient lies on his back, percussion affords a tympanitic note but a line of dulness can be traced at each side of the swelling, which varies according to the position of the body and the amount of food contained in the organ. A splash can be heard through the stethoscope when a slight blow is given to any part of the tumour. In most cases a feeling of thickening or a tumour can be discovered at the pylorus, but this is often dragged out of its normal position by the weight of the distended stomach. The diagnosis is often made more easy by the distension of the stomach with soda and tartaric acid (371), or by making the patient drink some soda-water or other effervescing liquid. The stomach-tube when introduced passes downwards to an unusual distance, and any fluid removed will be found to be frothy, of a dark colour, and containing torulæ or sarcinæ. If it is introduced in the early morning, after the patient has been fasting during the night, a considerable quantity of partially digested food will be withdrawn.

503. It is possible that a dilated stomach may be mistaken for an encysted tumour, but the use of the stomach-tube will remove any difficulty.

504. A *partial thickening* of the walls of the stomach forms a tumour that usually presents itself in the epigastric or right hypochondriac region, but it may be situated in the left side or below the umbilicus. There is rarely any visible movement. The note is dull on light percussion, but a tympanitic sound can be evoked by a forcible stroke. This is especially the case after the stomach has been distended with gas. The tumour feels solid, and is

usually nodular, its longest axis lies across the epigastrium, it moves somewhat with respiration, and distension of the stomach displaces it downwards. Almost all the tumours of this kind are of a malignant nature, so that the patient suffers from pain and vomiting, attended with a rapid loss of flesh and strength. The fluid removed after a test meal shows an absence or great diminution in the amount of free hydrochloric acid. If the tumour is situated in the pyloric region the whole stomach is usually dilated.

505. There is often considerable difficulty in determining whether a tumour in the epigastrium is connected with the liver or the stomach. If with the liver its connection with that organ can generally be traced with the finger, and it descends with respiration : if with the stomach, the amount of movement with inspiration is less, and it can be depressed by distending the organ. In gastric tumour forcible percussion brings out a tympanitic note and gurgling can be often detected over it, which is not the case with hepatic tumour. The prominent symptoms of gastric cancer are loss of appetite, pain after food, flatulence and vomiting of coffee-ground material, whilst a similar affection of the liver is often attended with jaundice. The absence of free hydrochloric acid after a test meal would point to an affection of the stomach. It must not, however, be forgotten that these affections constantly co-exist.

506. *General thickening* of the stomach gives rise to a tumour that has its seat in the epigastrium. It is elongated or globular in shape, and often produces a bulging at that part of the abdomen. There is no visible peristaltic motion. Light percussion affords a dull note, but a more forcible stroke brings out a tympanitic sound. There is an increased resistance on palpation and the swelling feels solid, the surface in some cases is nodular, in others smooth, with a well defined edge. If there are no adhesions it may move with respiration, but not to any great extent. The tumour does not descend after taking food. It is impossible from mere external examination to determine whether the tumour

is the result of malignant disease or only of fibroid degeneration, but in the latter there is less pain, emaciation is not so rapid, coffee-ground vomiting does not occur whilst a large excess of free hydrochloric acid has been sometimes found after a test meal.

507. When a gastric ulcer has perforated the peritoneum very slowly, so as to give time for the formation of adhesions, an abscess may take place that is usually situated between the diaphragm and the liver. In most cases it contains air as well as pus, as the communication with the stomach is still maintained. A perigastric abscess (*subphrenic abscess*) thus produced rarely gives rise to a well defined tumour, but the epigastric region is seen to bulge forwards from the pushing downwards of the liver. It is most common on the left side. The ribs are thrown outwards, and do not move on respiration, the diaphragm is raised, but the heart is not displaced to the right. The percussion note over the upper part of the abdomen and at the lower part of the chest is tympanitic, but there is usually some dulness on percussion behind from the compression of the lung. There is amphoric respiration and metallic tinkling, as in pyo-pneumothorax (168).

508. LEFT HYPOCHONDRIUM.—*The tumours in this part are usually connected with the spleen, kidney or colon.*

509. In a healthy person you are unable to feel the spleen below the ribs, but enlargement of this organ occurs in various acute and chronic affections, and gives rise to a swelling of considerable extent. In typhoid fever, pyæmia, acute tuberculosis and other febrile diseases you will find the spleen enlarged, but it seldom attains to any great size. Tumours formed of this organ present themselves in malarial affections, in leuchæmia, lardaceous degeneration, Hodgkin's disease, and cirrhosis of the liver. They attain the greatest bulk in leuchæmia, lardaceous degeneration, and in those who have suffered severely from

ague. A moderate enlargement causes only a projection below the arch of the ribs, but as the tumour increases it extends downwards and forwards towards the navel, and may fill the whole of the left side of the abdomen. When it has reached a considerable bulk it forms a visible swelling, the veins over it being often enlarged. As it is superficial, the percussion note over it is dull, but it is not unusual to find its lower edge covered by the colon. The tumour feels solid, the surface is smooth, its edges rounded, and two or three notches can be generally traced along its anterior border. It moves with the respiration and can be somewhat displaced by the fingers. There are rarely any local symptoms connected with these tumours, but there is often a feeling of uneasiness produced by their weight. You must always examine the blood with the microscope, as there is usually a great increase in the number of the white corpuscles. Hæmorrhage is apt to take place from the nose, mouth, and other mucous membranes.

510. You may confound an enlarged spleen with enlargement of the liver (495), or of the kidney (515), or with a fæcal accumulation. In fæcal accumulation the form of the tumour is more irregular, there are no notches, and in most cases a tympanitic note can be evoked by forcible percussion. Pressure of the fingers slightly alters the shape of a fæcal accumulation, there is a history of long-standing constipation, alternating, perhaps, with attacks of diarrhœa, and there is an absence of the alterations in the blood, and of the hæmorrhages from the mucous membranes which accompany enlargements of the spleen.

511. Various diseases of the kidney give rise to abdominal tumours, but they vary greatly in the appearances they present and are often difficult of diagnosis. The most common forms are pyonephrosis, renal abscess, hydronephrosis, cystic and hydatid tumours, and malignant new growths. They are usually met with in the lumbar, hypochondriac or umbilical regions, but in rare instances they may occupy a large portion of the abdominal cavity.

It is often necessary to examine the patient in different positions. In most cases you let him rest upon the back, with the legs well raised and the knees bent. You place one hand behind on the lumbar region, whilst you gradually depress the other hand in front, and by slowly bringing them together as far as possible, you will in a thin person be usually able to grasp the kidney. In case of a large renal tumour you may find it advantageous to lay the patient on the opposite side, whilst you place your hands behind and in front of the swelling. In other instances you make him rest on his elbows and knees, and the weight of the tumour will often draw it forwards and enable you to ascertain its situation and connections.

512. You may readily mistake a healthy kidney which is unduly movable for a renal tumour. A movable kidney is most frequently met with in thin females, it is most common on the right side and can be felt to move slightly with the respiration of the patient, and can be pressed backwards into the loin by the fingers. It is of the size and shape of a normal kidney, and in most cases the patient does not suffer any pain or inconvenience from its undue mobility.

513. You are very apt to mistake various tumours situated in the right hypochondrium for a movable kidney and when there is any doubt you should carefully repeat your examination before you settle the diagnosis. An enlarged gall-bladder has most frequently been confounded with a movable kidney; the former is, however, more superficial, as it is not covered by the colon, the percussion note is dull, it feels more elastic, the edge is less defined, it moves more freely with the respiration, and cannot, as is the case with a movable kidney, be pressed backwards into the loin, or fixed with the finger during expiration. In addition to these, there is almost always a history of attacks of biliary colic, often of jaundice.

514. A renal tumour often produces a well-marked bulging in the front of the abdomen, but it rarely gives rise to any visible fulness in the lumbar region. The veins both

in front and behind may be greatly enlarged, especially when the growth is of a malignant character. You must remember that the kidney lies deeply, so that when it enlarges, the colon is usually pushed in front of it. In consequence of this, the percussion note over a part or whole of the tumour in front may be tympanitic, and it is only with a forcible stroke that you can bring out the dull sound of a solid body. Occasionally the tumour is crossed by part of the colon which has become adherent to it, so that, judging from the percussion note, you might imagine that there were two or more separate tumours. In rare cases the intestine is pushed on one side, so that the note is dull over the whole swelling. Behind there is no tympanitic sound between the tumour and the spines of the vertebræ. There is a sense of elasticity, or even of fluctuation, when the swelling consists wholly or partially of fluid, in other cases it feels hard and solid and has a well-defined edge. The edge is always round, never sharp, like many of the tumours of the liver. In most cases the tumour is incapable of movement by the fingers, but occasionally you can press it backwards towards the loin. When, however, it moves with the respiration, the extent of motion is much more restricted than in the case of tumours of the liver or spleen. In most of the renal tumours the urine affords valuable aid in diagnosis. Thus, it may contain blood, pus, or tubercle bacilli, in other instances it is clear and free from all abnormal constituents.

515. You distinguish an enlarged spleen from a tumour of the left kidney by finding that it is uncovered by the colon, and therefore quite dull on percussion, that it readily moves during respiration, and that its anterior margin is sharp, often notched, not round, as is the case with the kidney. In addition to these signs, the patient is usually anæmic and subject to hæmorrhages; whereas in enlarged kidney there is often blood or pus in the urine. The splenic tumour can be generally moved forwards with the fingers, and there is

a space between its posterior border and the spine, in both of which circumstances it differs from enlarged kidney.

516. Inflammation around the kidney usually gives rise to an abscess, and produces a tumour perceptible in the abdomen and in the lumbar region. At an early period there may be only a sensation of fulness in the loin, but as time goes on a well-marked, painful swelling becomes apparent, very tender on pressure, and red on the surface. The percussion note in front is usually clear, but there is extensive dulness behind. The tumour does not move with the respiration. When suppuration takes place there is a large painful swelling that fills up the whole of the loin. The patient suffers from severe pain, the thigh is flexed on the pelvis, there are often rigors, and the temperature is elevated and hectic in character. The pus, if not relieved by the surgeon, may point in the loins or burst into one of the neighbouring organs.

517. UMBILICAL REGION.—*In addition to the tumours already described as presenting themselves in the epigastrium and hypochondrium, we meet here with affections of the pancreas, colon or omentum, and aneurysm of the abdominal aorta.*

518. Cysts of the pancreas large enough to form a perceptible tumour are very rare. They may present themselves to the right of the navel or may, when larger, occupy the umbilical region. They are covered in front by the stomach, colon or duodenum, so that their apparent size and the physical signs accompanying them may vary at different times of the day. They feel elastic, and are very tense, do not move with the respiration, nor can they be displaced by the hand. When covered by the duodenum a well-marked gurgling sound may be heard over the tumour two or three hours after a meal. The fluid removed by aspiration is turbid, dark coloured, or blood stained, and may convert starch into sugar. The patient is often liable to severe attacks of

spasm like biliary colic. The complaint occasionally follows an injury to the abdomen.

519. Cancer of the pancreas rarely forms an abdominal tumour that can be detected during the life of the patient. When it does so, it is usually situated below the lower edge of the liver or to the right of the navel. As it lies deeply, light percussion gives a tympanitic, and a more forcible stroke a dull sound, and the facility with which it can be detected varies according to whether the stomach and colon are full or empty. The tumour is elongated, solid and nodular, with a well-defined edge. It may pulsate from the impulse communicated to it by the abdominal aorta and it does not move with the respiration. It is generally accompanied by jaundice, sometimes the stools are fatty, and occasionally the urine contains sugar.

520. Tumours of the intestines are mostly connected with the colon, and may arise from fæcal accumulations (483), fæcal abscess, or malignant disease.

521. Fæcal abscess is commonly met with in the region of the cæcum, but it may present itself in any part of the course of the large intestine. It may be the result of an injury, but is generally caused by an ulceration of the mucous membrane that has perforated the peritoneum so slowly as to give time for the formation of adhesions. In the neighbourhood of the cæcum it usually arises from appendicitis, but in other parts of the large intestine it may follow chronic catarrh, dysentery or tubercular ulceration. The tumour is usually well defined, and affords a tympanitic note on forcible percussion, while a gurgling sound can be heard with the stethoscope, on account of the passage of the gas through the intestine. When the abscess lies behind the gut the percussion note may be quite tympanitic, and it is then often very difficult to arrive at a correct conclusion. In all cases there is pain and tenderness over the tumour, the stools often contain blood or pus, and the temperature is elevated and of a hectic type.

522. Malignant disease is by far the most common cause

of a tumour connected with the large intestine. The left iliac region is its usual site, but it is not infrequently observed in the cæcum, or at the hepatic or splenic flexure of the colon. The tumour is well defined, often nodular, and if obstruction has taken place, there is a well-marked visible movement of the intestines in front of it. The peristaltic motions are quick and forcible, each spasm being accompanied by a griping pain and by the gurgling of the intestinal contents as they are driven forwards by the contraction of the muscular coat. The percussion note is tympanitic with a forcible stroke, and the tumour moves freely with the respiration, unless extensive adhesions have taken place. Gurgling of the intestinal contents can be heard over the tumour with the stethoscope. The size of the swelling often varies from time to time, according to the amount of accumulation that may be present in it. Either constipation or diarrhœa is complained of, and the stools often contain blood or pus.

523. You will most frequently encounter tumours of the omentum in the umbilical region. They may be either tubercular or malignant (459). In the tubercular there is an elongated mass, usually not well defined, especially at its edge, and tender on pressure. Slight percussion gives a comparatively dull note, but a more forcible blow brings out a tympanitic sound on account of the viscera containing air that lie below it. It is accompanied by exudation and other signs of peritonitis. The temperature is elevated, the pulse quickened, the abdomen distended. These symptoms, along with the loss of flesh and perhaps a simultaneous affection of the lungs or pleuræ, will determine the diagnosis.

524. In malignant disease of the omentum there is almost always ascites, and other tumours, which are tender on pressure and increase quickly in size and number, may be generally discovered in different parts of the abdomen. It is accompanied by rapid emaciation, loss of appetite, constipation, and pains of the abdomen, which are increased by food or hot liquids.

525. You will often meet with cases in which there are numerous tumours of a cancerous nature in the peritoneum, but they are almost always attended by ascites, and it is frequently necessary to remove the fluid by tapping before you are able to detect them. They vary greatly in size and shape, are dull on percussion, feel hard, and they are accompanied by the usual symptoms of cancerous growths. When the patient is a female, carefully examine the pelvis, for tumours of the peritoneum often originate from disease of the uterus or its appendages.

526. Enlarged mesenteric glands seldom produce an abdominal tumour. Sir W. Jenner states that " enlarged glands may sometimes be detected by grasping the two sides of the abdomen between the hands or between the fingers of one hand ; then by bringing the fingers slowly together, you may at last feel the glands between your fingers." When enlarged lymphatic glands are big enough to form a distinct tumour, it is usually fixed and cannot be moved either by respiration or the pressure of the hand.

527. Aneurysms of the aorta and its branches are most generally met with in this and in the epigastric region. They are distinguished by the severe neuralgic pains, the pulsation, and systolic murmur that accompany them. You must, however, be on your guard not to mistake for an aneurysm an increased pulsation of the aorta that is often met with in dyspeptics, especially in females, or the pulsation of a tumour situated over the vessel. You should endeavour to grasp the tumour on each side, and as an aneurysm expands equally in all directions with each impulse of the heart, you will feel the dilatation as much at the sides as in the front, if it is an aneurysm. Remember that a murmur may be produced by the pressure of the stethoscope ; in cases of aneurysm you will often be able to hear a murmur behind the spine, as well as in front.

528. You will occasionally meet with tumours arising from the bones or cartilages. These lie deeply, feel hard, and are generally covered by the viscera which have been pushed

forward or displaced by the new growth. You will in most instances be able to trace them to the part of the pelvis or spine from which they have arisen.

529. Right and Left Iliac Regions.—On the right side tumours of this region are usually the result of appendicitis (448), fæcal accumulation (483), or tubercular or malignant disease of the cæcum (447). On the left side, affections of the sigmoid flexure are generally met with. In both you may meet with pelvic abscess, retro-uterine hæmatocele and tumours connected with the uterus or ovaries. Occasionally you may find a displaced kidney forming a tumour in this region.

530. Hypogastric Region.—Diseases of the bladder and uterus usually form the tumours situated in this part. Sometimes in chronic peritonitis, pus is found enclosed in a sac formed by coils of the intestines adherent to each other. In very rare cases you may meet with a tumour caused by a vastly dilated appendix vermiformis.

CHAPTER XII

DISEASES OF THE BRAIN

531. THE chief diseases to which the brain and its membranes are liable are: acute, chronic, tubercular, and cerebro-spinal meningitis; congestion and anæmia of the brain; encephalitis, abscess, hæmorrhage, softening, disseminated sclerosis, atrophy; and embolism of the vessels. In addition to these, there are certain affections of the nervous system which are classed as functional, because anatomical changes are not usually discovered after death—these are chorea, epilepsy, paralysis agitans, tetanus, hysteria, and hydrophobia.

532. MENINGITIS, or inflammation of the membranes of the brain. The dura mater may be alone affected, or the disease may be limited to the arachnoid and pia mater, which are usually affected together.

In inflammation of the dura mater (*pachymeningitis*) the membrane is thickened, often infiltrated with pus, or there may be a collection of pus between the membrane and the bone. It rarely occurs excepting as a result of injuries or disease of the bones of the skull, caries of the temporal bone being the most common affection that gives rise to it.

Inflammation of the pia mater and arachnoid (*leptomeningitis*) may present itself in an acute or chronic form. It is further divided into simple, purulent, tubercular and infective (cerebro-spinal) meningitis.

In the *acute form* the membranes are reddened, the blood-vessels are much enlarged and loaded with blood, and the arachnoid is opaque, lymph, or in some cases pus, being situated beneath it. The pia mater is stripped with difficulty from the surface of the brain, which is soft and easily torn away. The lining membrane of the ventricles may be swollen and their cavities filled with an opaque fluid. Microscopically, the membranes on the surface and in the sulci are found to be crowded with leucocytes, which tend to compress the superficial vessels.

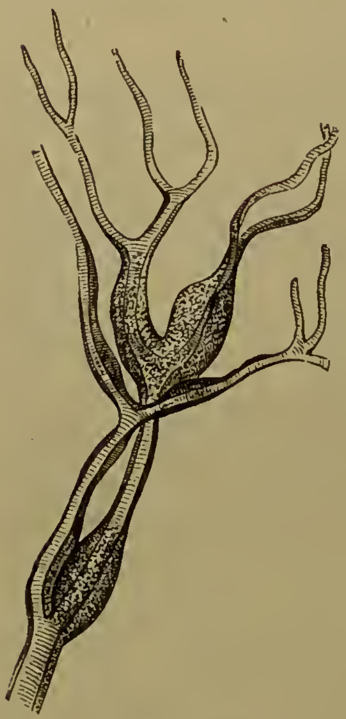
Meningitis may affect the whole surface of the membranes, or it may be limited to the base or to the convexity of the brain, but when not tubercular it is chiefly confined to the latter. The disease occurs at all ages, but is most common in children. It may result from (1) fracture and other injuries of the skull; (2) acute specific fevers, pneumonia, typhoid, scarlatina; (3) caries and necrosis of the bones of the head; (4) pyæmia. In most cases the pneumococcus of Fränkel may be detected in the inflammatory exudation.

In *purulent meningitis* the surface of the membrane is covered with a layer of pus; it usually results from injuries, disease of the bones of the skull, or septicæmia.

In *tubercular meningitis* the surface of the brain is flattened, and the ventricles are filled with fluid; the disease has therefore been named acute hydrocephalus. The substance of the brain is soft and pulpy, especially in the neighbourhood of the ventricles; the membranes at the base of the organ, chiefly at the optic commissure and the fissure of Sylvius, are thickened, covered with lymph, and studded with small grey miliary tubercles; the membranes on the upper surface are usually but little affected. Microscopically, the tubercles appear to arise from a growth of round cells in the external coat of the arteries (see fig. 100) The swellings thus produced compress the arteries, and in some cases the coats of the vessels are perforated by the inward growth of the cells. The obstruction to the circulation gives rise to congestion and afterwards to inflammation of the membrane. Tubercles are generally present also in the lungs or other organs. The inflammation is usually confined to the base of the brain. The disease is most common in children, and is the result of a general tubercular affection.

533. In Cerebro-Spinal Meningitis there is great congestion of the pia mater of the brain and spinal cord. At an early period of the disease the amount of exudation may be small, but at a later stage both lymph and pus are usually present. The ventricles sometimes contain a turbid fluid, and the substance of the brain and spinal cord often presents evidence of inflammation and of softening. The disease occurs in the form of local epidemics, and depends upon a specific poison. The pneumococcus (Fränkel) is often found to be the exciting agent.

Fig. 100.



Tubercular affection of a branch of the artery of the Sylvian fissure. The tubercle is seen to have been developed in the outer coat, and compresses the channel of the vessel. (Rindfleisch.)

534. In Congestion of the Brain the vessels of the membranes are loaded with blood, the grey matter of the convolutions appears to be redder than in the normal state, and an unusual number of bloody points are visible when the substance of the organ is divided. When congestion has been continuous, or often repeated, the blood-vessels become enlarged, and more or less wasting of the substance of the brain takes place. *Active* congestion may arise from (1) an increased action of the heart, as in hypertrophy; (2) inflammation of the brain or the meninges; (3) excessive intellectual labour or mental excitement, as in the

delirium of fever. *Passive* congestion depends on any circumstance that prevents the ready return of the venous blood from the brain, such as the pressure of a tumour, or disease of the heart or lungs.

535. In Anæmia of the Brain or Ischæmia, the grey substance is pale, and when cut very few bloody points are visible. It may be general or confined to one part of the organ. It results from (1) any circumstance that lessens the quantity of blood in the body, such as hæmorrhage, chronic diarrhœa, &c.; (2) any morbid condition that encroaches on the cavity of the skull, as, for instance, cerebral hæmorrhage or tumours; (3) the obstruction of an artery by an embolus or thrombosis.

536. Encephalitis, or inflammation of the substance of the brain, may affect the whole or only a portion of the organ. General encephalitis is associated with meningitis, and is confined to the surface just below the inflamed membrane; when localised, it may give rise to abscess or to softening of the brain. When it has terminated in abscess, you find, in recent cases, an irregular cavity filled with yellow, green, or reddish-coloured fluid, surrounded by softened brain-structure; in older cases the pus is *encysted*, that is, enclosed in walls formed of connective tissue. You do not necessarily meet with true pus-cells in the contents of the abscess, but often only granules and exudation corpuscles in various stages of degeneration. Abscess is most common in the temporo-sphenoidal lobes and cerebellum, rare in other parts of the brain. When encysted, it may remain stationary for a length of time; it may produce death by setting up inflammation, by its interference with the cerebral functions, or by bursting externally or into the ventricles.

Abscess of the brain may result from (1) injuries to the skull; (2) suppurative disease of the middle ear; (3) septic embolism; (4) pyæmia; (5) abscess of the lung or empyema; (6) suppuration of a cyst.

537. Atrophy of the Brain is often due to chronic

encephalitis. The organ is small, the membranes thickened and adherent, and there is an excess of fluid in the skull. On section the cortex is diminished in thickness, and under the microscope exhibits signs of chronic inflammation.

538. SOFTENING OF THE BRAIN OR SPINAL CORD is a frequent result of inflammation; it may also occur in any part that is deprived of its due supply of blood, either by the artery leading to it being obstructed by an embolus or thrombosis, or by the pressure of a tumour or hæmorrhagic clot. It is usually named "red," "yellow," or "white softening," according to the colour it presents; the red colour being the result of small hæmorrhages that have taken place into the softened structure. Microscopically, the nerve-tubes appear to be broken up and mixed with blood-cells, granular matter, and dark, granular, and fatty bodies, like mulberries, named "compound granular corpuscles." The minute arteries are covered with granular and fatty matters. Softening is most frequently found in the cortex, the corpus striatum and the optic thalamus, but it may present itself in any part of the brain; in the spinal cord the anterior cornua are especially liable to undergo this change. It is apt to occur (1) from injuries; (2) diseases of the heart; (3) atheroma and syphilitic affection of the arteries; (4) various chronic diseases that tend to produce great feebleness of the circulation, such as cancer, phthisis, &c.: in the spinal cord from inflammation, or from compression resulting from diseases of the vertebræ or tumours of the cord.

539. HÆMORRHAGE OF THE BRAIN is the most frequent cause of apoplexy and paralysis; it may take place outside the dura mater, into the cavity of the arachnoid, or into the substance of the brain. It is usually distinguished as *capillary hæmorrhage*, or as *hæmorrhagic clots*. The latter generally occurs in the corpus striatum or optic thalamus, or in the white substance adjoining these structures. Hæmorrhage is very rare in the spinal cord.

In *capillary hæmorrhage* the part affected is reddish or of a yellow colour, soft or pulpy, and dotted with minute spots of blood. It may go on to yellow softening, to suppuration, or to the organisation of the blood-clots. These minute extravasations of blood are liable to occur in all acute cerebral inflammations, in the vicinity of an occlusion of an artery by a clot or disease (atheroma) of the lining membrane of the vessels.

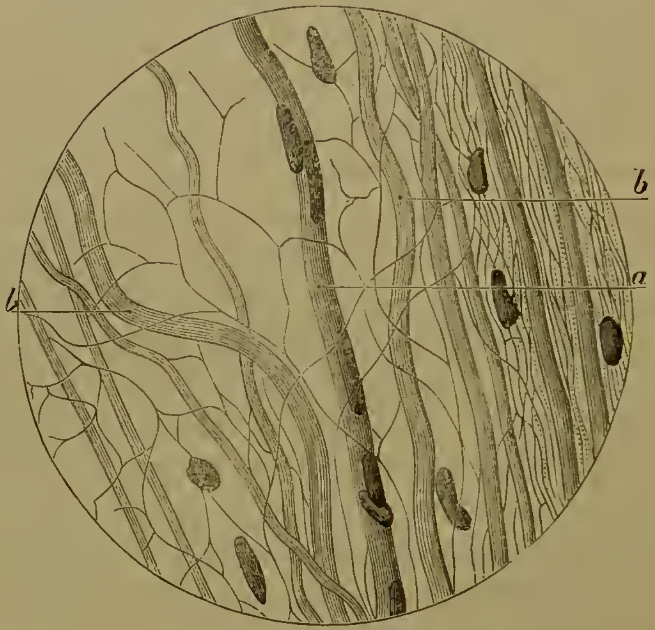
In the case of *hæmorrhagic clots*, the blood is found mixed with soft, or broken-up and discoloured brain-substance, or it may have burst into and filled the ventricles. When the patient survives, the fluid part of the blood is absorbed, the coagulum shrinks, the surrounding cerebral substance, at first torn and softened, regains its natural consistence, and either a cyst is formed or a cicatrix alone remains. Extensive cerebral hæmorrhage is usually caused by fatty or atheromatous disease of the blood-vessels, by softening of the tissue of the brain, or by aneurysms. Aneurysms of the smaller arteries in the substance of the brain are almost always met with in cases of cerebral hæmorrhage, and are known as "miliary aneurysms." They vary from $\frac{1}{100}$ to $\frac{1}{25}$ of an inch in diameter, are rarely met with in persons under forty years of age, but are common in the aged. Cerebral hæmorrhage often accompanies disease of the kidneys and hypertrophy of the heart.

540. SCLEROSIS, or hardening of the nervous tissue, occurs both in the brain and spinal cord. It may be the result of inflammation or of a degenerative process. It is present in disseminated sclerosis, bulbar paralysis, and in the degenerations so often met with in the spinal cord.

The *inflammatory grey degeneration* gives rise to hardness and diminution in the bulk of the affected parts. Microscopically, the connective tissue is increased in amount, the nerve fibres are compressed, atrophied, and ultimately disappear, and the coats of the blood-vessels are thickened. In slight cases the amount of thickening is small, but when the disease is of long duration the nerve fibres may be entirely absent, and the part may consist only of connective tissue. In the *non-inflammatory degeneration* the same appearances are presented, but it is believed that the degeneration of the nerve fibres precedes the increased growth of the connective tissue.

541. Multiple or Disseminated Sclerosis.—This usually affects both the brain and spinal cord. A number of hard, dense, isolated, and well-defined patches of a greyish material may be seen in various parts of the nervous centres, the white matter being the chief seat of the morbid change, and the nerves coming from the patches being often involved in the disease. Microscopically, the patches present a network of fine fibres beset with nuclei. In parts recently affected, traces of nerve fibres are still visible, but when the change has been of long duration none can be discovered, the coats of the blood-vessels are usually thickened (fig. 101).

Fig. 101.



Section of a patch of multiple sclerosis as seen under the microscope. *a*. Capillary blood-vessel. *b*. Axis-cylinders of nerves. Between the nerves are seen the fibres of recently formed connective tissue. (Charcot.)

In the brain, the patches are most common in the corpus callosum, corpus striatum, and in the white substance near the ventricles. In the spinal cord they vary greatly in their extent and situation.

542. In Chronic Hydrocephalus the ventricles of the brain are distended with fluid, and the substance of the organ is expanded, thinned, and softened by the pressure of the fluid. The head becomes greatly enlarged, the bones of the skull are widely separated, and the fontanelles remain open. It may commence as a congenital affection, or the fluid may collect by the "veins of Galen" becoming obstructed by meningitis, the pressure of a tumour, or any other cause that hinders the return of the blood from the intra-ventricular blood-vessels.

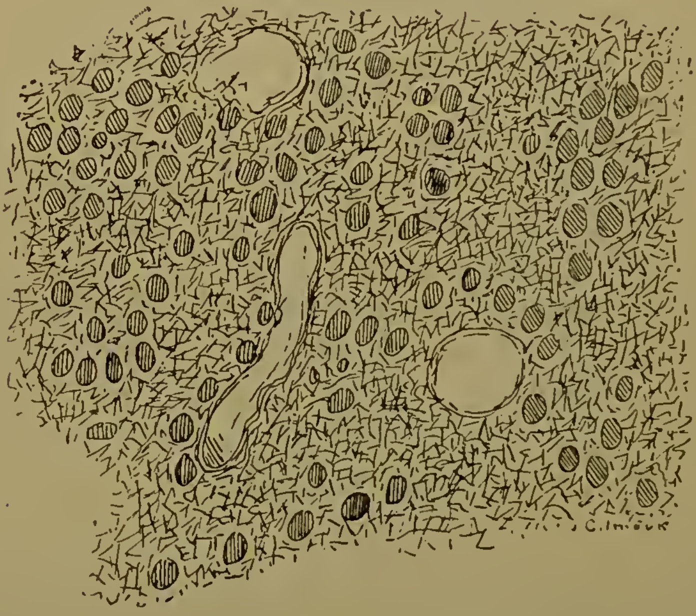
543. Tumours of almost all forms are found in the brain; they are most frequently located in the cerebral hemispheres, the cerebellum, and the pons, but they may occur in any part of the nervous centres.

Tubercle frequently presents itself in the membranes of the brain, in the form of the grey miliary tubercle, producing meningitis. In children, a firm, yellow, cheesy mass is often found in the cerebral tissue, constituting a *tubercular tumour*. These tumours consist of a caseous centre surrounded by a zone of translucent grey tissue. Microscopically, the typical tubercular structure can be detected at the periphery of the mass, with signs of inflammation in the brain substance in the immediate neighbourhood of the tumour. Tubercular tumours are especially common in early life. They are most frequent in the cerebellum, but they occur also in the cerebrum and in other parts of the brain. They vary from the size of a pea to that of an egg, and there may be more than one present at the same time. If they are situated near the surface of the brain, tubercular meningitis often results.

Syphilis attacks the brain in the form of gummata which grow from the meninges. The tumour varies considerably in size, and is most common at the base of the brain. It consists of a caseous centre surrounded by inflammatory thickening of the meninges and brain substance. In many cases the membranes in the neighbourhood are covered with a gelatinous layer (*gummatous meningitis*) which compresses the cranial nerves. The inner coats of the arteries are thickened and their lumina narrowed (*endarteritis obliterans*), and often obstructed with blood-clot.

Glioma is the name given to a form of tumour which originates in the connective tissue of the nervous substance. It affects the brain, nerves, and retina, and is of slow growth. In appearance it may closely resemble the brain substance, and its boundaries are often very indistinct. It is most commonly met with in the substance of the hemispheres, and is frequently the seat of hæmorrhage arising from the rupture of its vessels. Microscopically, it consists of small round cells, enclosed in a fibrillated matrix (fig. 102).

FIG. 102.



Glioma of the brain. (COATS.)

Primary cancer of the brain is rare, and is usually connected with one of the ventricles; secondary cancer occurs in the form of multiple tumours. *Sarcomata* are usually of the round cell variety, and appear as circumscribed masses in the substance of the brain. They may soften and form cysts, or blood may be effused into their substance. Sarcoma of the lung is often followed by sarcoma of the brain.

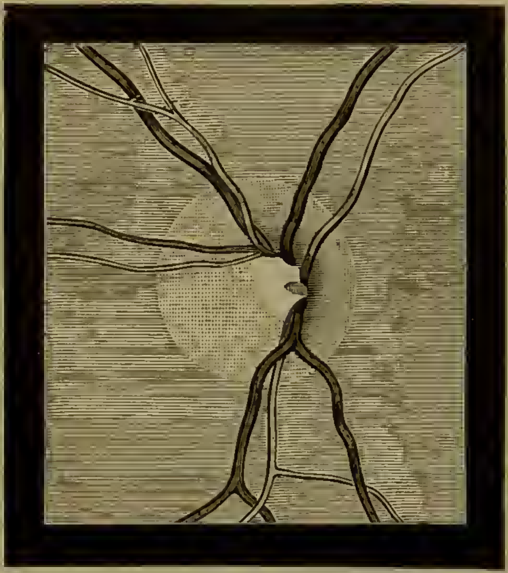
Parasitic cysts are occasionally found, and may be either hydatid or cysticercus cellulosæ. They are generally found in the cerebral hemispheres, near to or within the ventricles.

544. One of the means of physical diagnosis that you will find useful is the ophthalmoscope, but a considerable amount of practice is required to enable you to employ it properly. The form of instrument most generally used consists of a slightly concave mirror and a double convex lens. Students frequently neglect to obtain the skill requisite to enable them to use this instrument, and consequently cannot avail themselves of the valuable aid it affords in the diagnosis of cerebral tumours and other forms of disease. Dr. Gowers very properly recommends that the student should at first accustom himself to its use by practising upon the eye of a fellow-student, the observer in his turn submitting to a similar examination. The interior of the eye may be explored by the ophthalmoscope either by the indirect or by the direct method.

545. When about to employ the instrument in the indirect method the patient must be placed on a chair in a darkened room, whilst you seat yourself exactly opposite, and slightly above him. A gas or other bright lamp should be placed on a level with and on the same side, but a little behind the eye you wish to examine. Supposing you are desirous of looking into the left eye, take the handle of the mirror in your right hand and adjust its central perforation to your right eye. Then throw the light from the mirror upon the

eye, and vary your distance until you observe the pupil brightly illuminated. Keep the mirror in this position, and place the convex lens a little distance from the pupil. Direct the patient now to look at the wall over the tip of your left ear, and by slightly varying the distance of the lens you will soon catch a view of a retinal blood-vessel. Trace this in the direction of its increasing thickness until you see a white circular patch from which the vessel seems to emerge; this is the optic disc. The optic disc is a nearly circular, well-defined, reddish-white patch, through which the retinal arteries and veins enter the eye. The arteries are smaller and of lighter colour than the veins; the main trunks of both pass upwards and downwards before dividing into branches (see fig. 103).

FIG. 103.



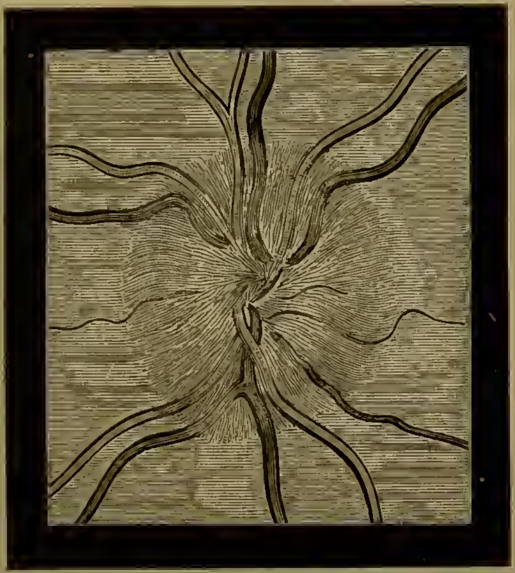
Right optic disc. Characters normal, outline clear. (GOWERS.)

In the direct method the observer does not employ a convex lens, but comes as close as possible to the patient, so as to view the interior of the eye magnified only through the crystalline lens.

546. Optic neuritis and optic atrophy are the conditions that are most important in the diagnosis of cerebral diseases. Optic neuritis is indicated by swelling and increased vascularity of the disc. You cannot derive much information merely from increased vascularity, as the colour of this part varies greatly in different persons. The earliest indication of neuritis consists in a swelling of the disc, and this is most readily observed at its edge, which first loses its sharpness

on the nasal side and is soon followed by a general obscurity of its whole outline. "The prominence of the swelling is readily recognised by the apparent change in the relative position of the structures that are on different levels, when the observer moves his head from side to side or up and down in the direct examination, or moves the lens in a like manner in the indirect examination. At first the retinal vessels present little change in size, but as the swelling increases the compression causes the veins to become broader and the arteries narrow, and extravasations of blood may be visible on the surface or margins of the swollen area"* (see fig. 104).

FIG. 104.



Left optic disc. Well-marked neuritis. Edge of disc invisible, concealed by a reddish-grey swelling, which extends beyond the normal limits of the disc. (GOWERS).

547. Optic neuritis is most frequently met with in tumours of the brain, but it may also present itself in meningitis and abscess of the brain. It is scarcely ever present in cases of cerebral hæmorrhage or softening, but it occasionally occurs when softening has resulted from embolism. It is not, however, confined to cerebral diseases, but is found in albuminuria, chlorosis, lead-poisoning, anæmia, and also occasionally in scarlatina and typhoid fever.

548. In optic atrophy the edge of the disc is more distinctly marked than in the normal condition, and the

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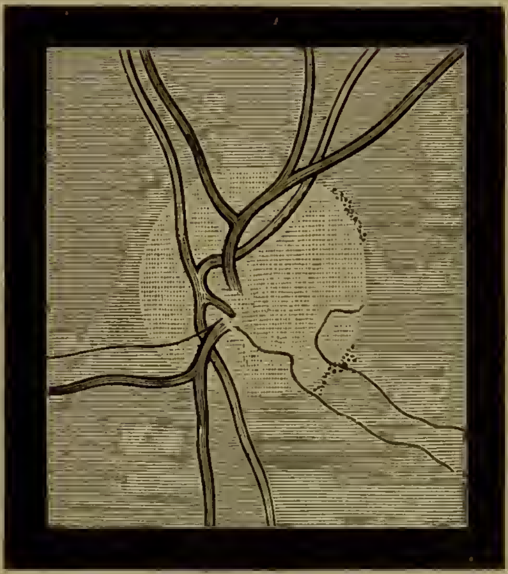
* Gowers, "A Manual of Diseases of the Nervous System."

surface is depressed. The retinal vessels may, or may not, appear to be diminished in size, but the whole surface is strikingly pale. "The part on which attention should be chiefly fixed is that which normally possesses considerable vascularity, the nasal portion. The tint may be observed to become gradually paler, the red sometimes simply fading and leaving a white colour in its place; in other cases a grey becomes mingled with the red, and gradually preponderates as the red tint fades, and ultimately a pure grey is left" (fig. 105).*

FIG. 105.



Atrophy of the left optic disc in a case of cerebral disease. (GOWERS.)

549. Optic atrophy often results from optic neuritis, but it also occurs without previous inflammation of the disc. Thus it is sometimes observed in disseminated sclerosis and in general paralysis of the insane, it often precedes or follows locomotor ataxia, whilst in other cases it results from pressure by tumours upon some part of the optic tract.

In each case that comes before you, first ascertain if there is any striking alteration in the mental condition of the patient. If so, begin at (550); if this is not the case, investigate his powers of motion (578). If you are still in doubt as to the nature of the disease, inquire as to the presence of severe pain of the head (595), and observe if the skull is increased in size (607). In the course of any case all the functions of the nervous system may be implicated, but by careful inquiry into the history of the disease you will generally be able to discover which have been most prominently affected.

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* "A Manual and Atlas of Medical Ophthalmoscopy," by W. A. Gowers, M.D.

SECTION I

THERE IS AN ALTERATION IN THE MENTAL CONDITION

550. A loss of consciousness may be partial or complete. When partial (*partial coma*), the patient can be roused so as to answer questions, although he quickly relapses into a state of apparent unconsciousness of what is going on around him; the reflex actions may be normal or even increased. In *deep coma*, the patient can neither answer questions, nor is he sensitive to light or other stimuli, the reflex actions are usually diminished or lost, the pupils may be widely dilated or contracted, swallowing is difficult or impossible, the urine or fæces may be retained or passed involuntarily, and the breathing is often heavy or snoring (stertorous).

551. In delirium, the manifestations of mental action are perverted; in *low muttering delirium* the patient seems to be unconscious of all around him, he talks incoherently in a low tone, with words imperfectly articulated; in *active delirium* the mind is in a state of intense activity, the patient is constantly talking in a rapid, rambling manner, ever changing his position, is often so violent as to require restraint, and is capable of great and sustained muscular exertion.

552. **A. You find suspension of the mental faculties.**

A state of partial or complete coma may result from any serious disease of the brain, such as a tumour or meningitis, or from any disorder that has greatly exhausted the strength of the patient, so that it not infrequently occurs in the final stage of fevers, pneumonia, &c. When, therefore, you are called to a person in a state of coma, first ascertain if it has been preceded by some other illness, and, if so, the diagnosis must be determined by the history of his previous symptoms. If it has occurred suddenly, it may have arisen from apoplexy, an injury to the brain, uræmia, poisoning by alcohol, opium, or some drug, from epilepsy, sunstroke, or catalepsy.

553. *a.* The patient is in a state of stupor, the pupils of the eye are dilated, the respiration is laborious and snoring, the swallowing difficult, the power of the limbs is lost; the pulse slow, sometimes irregular and intermitting. The urine is retained, or both fæces and urine are passed involuntarily.

The disease is *apoplexy.*

Apoplexy is most common in the male sex. When it is the result of hæmorrhage, as is generally the case, it is rare below forty years of age, and the tendency to it increases as age advances. It is often an accompaniment of granular kidneys attended by hypertrophy of the heart, and is also met with in those who have suffered from gout or syphilis, or who have indulged in alcohol to excess.

Apoplexy may occur suddenly, or it may be preceded by headache, giddiness, and vomiting, or by difficulty in speaking, numbness or palsy of the limbs or face, or by affections of the eyesight or bleeding at the nose. It is only in rare cases that the patient becomes at once comatose; usually a feeling of numbness, or a slight loss of power of one side, or of one limb, difficulty of speaking, headache, giddiness, or confusion of thought precedes the unconsciousness. The loss of consciousness during the attack varies greatly in degree; it may be very slight and temporary, or it may be profound and remain unaltered until death. The pupils are often unaffected; in some cases they are dilated, in others contracted. The head and eyes are sometimes directed to one side, usually from the side on which the limbs are paralysed. In all but the slightest cases, two or three days after the attack there is a rise of temperature attended by headache, loss of appetite, quickening of the pulse, and other signs of fever, but generally these soon subside and the patient gradually improves. Usually, he remains more or less paralysed in the face and side of the body. In fatal cases the coma persists, the urine and fæces are passed involuntarily, the pulse becomes feeble and irregular, the respiration laboured, and the patient gradually sinks from failure of the respiratory centre.

554. In hæmorrhage into the ventricles there is profound coma, with general paralysis and rigidity of the muscles. When the bleeding occurs into the arachnoid the symptoms are similar to those of ventricular hæmorrhage, but are often accompanied by severe convulsions. When hæmorrhage has taken place into the pons Varolii, the pupils may be contracted instead of being dilated, there may be at first neither stertor nor paralysis, and the temperature may rise at once instead of being depressed. Rigidity or tonic contraction of the muscles is a sign of extensive hæmorrhage with laceration of the substance of the brain.

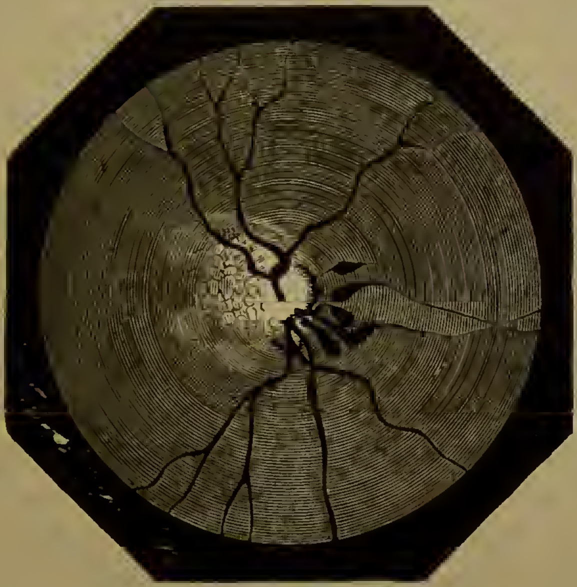
555. Apoplexy may arise from congestion of the brain (*congestive*), the rupture of a blood-vessel in the brain or its membranes (*sanguineous*), the closure of a cerebral artery by an embolus or thrombosis, or it may occur as the result of disease of the kidneys. When it has been caused by *congestion*, the patient has usually been affected before the fit with nausea, giddiness, dull pain of the head, sleepiness, and inactivity of the body and mind; in case of recovery the duration of the fit is short, the intellectual powers are soon regained, and no paralysis of the limbs or speech remains. If the fit has been produced by *hæmorrhage* into the substance of the brain, there is hemiplegia, recognised during the coma by twisting of the mouth and loss of power in the limbs of one side; the attack is not necessarily preceded by premonitory symptoms, the mental power, in case of recovery, is slow in returning, and paralysis of one side of the

body generally remains. In *embolism* there are usually no premonitory symptoms, but paralysis is present and has taken place suddenly, and evidence of valvular disease of the heart can be generally discovered with the stethoscope. In *thrombosis* the attack is frequently preceded by headache, giddiness, loss of speech, defect of memory, numbness of a limb or of one side, or other symptoms indicating cerebral disease. In disease of the kidneys you frequently have convulsions, the attack is more gradual than in the other forms, there is often no stertor, and the urine contains albumen.

556. When you are called to a case of coma, remember that it may be produced by an injury to the brain, uræmia, diabetes, or poisoning by spirits or opium, as well as by cerebral congestion or hæmorrhage. When you have the opportunity of obtaining a clear history of the case, you should ascertain if there has been any accident, or if the patient has been affected with kidney disease, or has been drinking to excess, or has previously suffered from an attack of paralysis, or from any of the premonitory symptoms of apoplexy. But where, as often happens, the person has been discovered in a state of insensibility, and no account of his previous condition can be obtained, you should first examine carefully the face and scalp for any marks of injury, and the ears for blood. Next, observe if the mouth is twisted, if there is deviation of the head or eyes, or if either side of the body is paralysed; if such be the case, a local lesion of the brain is indicated, and if there is no evidence of an accident, you may diagnose an affection of the brain or its membranes. If local paralysis is absent, see if the tongue has been bitten, as the occurrence of convulsions limits the causes of the attack to hæmorrhage, epilepsy, and uræmia. In this case test the urine for albumen, examine the heart for hypertrophy, and, if possible, ascertain the state of the eyes with the ophthalmoscope, as hæmorrhages and other signs of optic neuritis are often present, as a consequence of chronic disease of the kidneys (fig. 106).

When the coma has been produced by drunkenness, the face is usually flushed instead of pale, the pulse quick, the breath smells of spirits, the patient can be often roused to answer questions, the loss of motor power is seldom complete, and there are no convulsions. In opium poisoning the pupils are contracted, there is no stertor, and the coma gradually deepens. Since, however, the pupils are often partially contracted, and the coma is very deep in hæmorrhage into the pons Varolii, the diagnosis may be almost impossible, if there is no history of the attack. Remember in all doubtful cases to use the stomach-pump.

FIG. 106.



"A case of retinitis in albuminuria. The optic disc was ill-defined; the vessels were large and tortuous; on the apparent inner side were several small ecchymoses, evidently proceeding from the retinal vessels. On the apparent outer side was a hazy circle, indicating subretinal effusion, and at several points were white spots." (POWER).

557. *b.* The patient has become unconscious after exposure to the heat of the sun, the face is pale, the pupils are

contracted, the breathing is stertorous, the pulse is frequent, feeble, and often intermitting.

The disease is *sunstroke*.

The complaint arises from exposure to extreme heat, and is most liable to attack those who have been addicted to alcoholic excesses, who are in a depressed state of health, or have been subjected to extreme fatigue. It is most common in the tropics, but may affect persons in temperate climates in very hot seasons. The complaint is rare in this country. It is usually preceded by headache, sleeplessness, giddiness, heat and dryness of the skin, frequent desire to pass water, and in some cases by delirium or convulsions.

It is said by Sir Joseph Fayrer to present itself in different forms. In one the patient is suddenly seized with faintness or syncope, the skin is cold, pale, and moist, the pulse very feeble. Recovery is usual, but death may ensue from cardiac failure. After the exhaustion has passed away it may be succeeded by fever. In another form the complaint is ushered in with cerebral symptoms which may pass into a state of asphyxia. The temperature may rise to 106° or even to 110°. In a third the symptoms commence with syncope, but the temperature quickly rises to 104° or higher, there is great dyspnœa and restlessness, the pulse is full and labouring, the pupils contracted, unconsciousness comes on and passes into coma, often attended with convulsions. In case of recovery sunstroke is not followed by paralysis, but it often leaves persistent headache, inability for mental exertion, giddiness, and in some cases it is succeeded by epileptic attacks or insanity.

558. *c.* The patient, usually a female, appears to be unconscious, the eyes are open, the body is rigid, and the limbs remain fixed in any position in which they may have been when the patient was attacked, or in which they may be placed by others during the seizure. The pulse and respiration are natural, but are very feeble.

The disease is *catalepsy*.

The onset is usually sudden, and the disease is generally connected with hysteria. The attacks may continue for a few minutes only, or they may last for hours; they usually follow a severe mental shock, are never ushered in by convulsions, nor followed by paralysis. The temperature is not elevated, and there may be a complete loss of sensibility to pain and touch. A modified form of this complaint is sometimes observed in persons of either sex affected with softening of the brain.

559. *d.* The patient is subject to attacks in which he falls suddenly to the ground in a state of unconsciousness; the face is distorted, the pupils dilated and insensible to light, the limbs are violently convulsed, the lips blue froth issues from the mouth, the tongue is often bitten, the pulse is sometimes scarcely perceptible.

The disease is *epilepsy.*

It most frequently commences in early life, although it may attack for the first time persons of middle or advanced age. Epilepsy may arise from disease of the brain, from syphilis, lead-poisoning, the excessive use of alcohol, or it may be produced by irritation in some other organ; it is often hereditary, and a fright or mental excitement not infrequently gives rise to the first seizure. In females attacks may take place at, or near the catamenial periods, and in some they occur only at those times.

An attack is occasionally preceded for a few seconds by a sensation termed an "aura," originating in some part of the body or limbs and rising to the head: in other cases by giddiness, headache, or twitchings of a limb. The patient may be dull and sleepy or he may be excited and irritable before a fit.

The seizures are usually divided into *major* and *minor* The former are those attended with convulsions and loss of consciousness. Usually the first symptoms are a shrill cry and a twisting of the neck to one side, accompanied by distortion of the features. The colour of the face is at first unchanged, then it becomes pale, and as the convulsions proceed it turns livid, from the interference with the respiration. In some cases the urine is passed involuntarily during the fit.

CONTRAST OF EPILEPTIC AND HYSTERICAL SEIZURES.

	Epilepsy.	Hysteria.
History	Usually previous attacks or slight seizures	Hysterical and Dyspeptic symptoms
Causation	Affects either sex; often hereditary. No apparent exciting cause	Affects only females; usually mental excitement or bodily fatigue
Invasion	Sudden scream; distortion of face; pallor	Often gradual; palpitation; choking or other hysterical symptoms
Loss of consciousness	Sudden and complete	Often gradual and incomplete
Biting of tongue	Usual	Absent
Involuntary micturition	Usual	Absent
Talking and screaming	Absent	Often present
Duration of attack	Rarely more than ten minutes	Often prolonged
Attack followed by	Deep sleep; sometimes delirium	Exhaustion; no tendency to sleep or delirium

The attacks seldom last more than a quarter of an hour, and are succeeded by a deep, heavy sleep. During the intervals the patient may be in good health, but the mind often becomes gradually enfeebled, and he displays a want of physical and mental energy. Occasionally the fits are followed by violent delirium, or by a loss of power in one side of the body (hemiplegia). The attacks may take place only during the night and may be therefore easily overlooked. In such instances the involuntary passage of urine, stains of blood upon the pillow, soreness or wounds upon the tongue produced by the teeth, and a sense of fatigue felt by the patient in the morning may be the only indications of the disease.

In the *minor* attacks the unconsciousness only lasts for a few moments, the patient does not fall and there are no general convulsions.

Epileptiform convulsions arising from a definite cause, such as the irritation of teeth in children, syphilis, kidney disease, pregnancy, &c., are usually termed *eclampsia.*

560. Epilepsy may be simulated by hysteria, but in the latter, which only affects females, the unconsciousness is less complete, the patient is sensible to the dashing of cold water on the face, the convulsions do not come on so suddenly as in epilepsy, they are, at any rate to a great extent, under the control of the will, they do not occur during the night; the tongue is not bitten, the urine is not passed involuntarily, and the patient is often noisy and screams or cries. Also, during the intervals of the attacks, she is liable to palpitation, pain of the left side, choking in the throat, or paroxysms of laughing or weeping.

561. There is sometimes a difficulty in distinguishing between a slight fit of epilepsy and an attack of syncope. In epilepsy the unconsciousness takes place suddenly, in syncope it is preceded by a feeling of weakness and exhaustion. The recovery of consciousness in epilepsy is more rapid, the urine may be passed involuntarily, there may be muscular twitchings or convulsions, the patient may after the attack exhibit slight delirium or a tendency to sleep, none of which occur after syncope.

562. **B. The patient suffers from delirium.**

Remember that some amount of delirium, especially at night, is common where there is much fever. It often presents itself when some important organ is inflamed; in young persons a temporary state of delirium may arise even from dyspepsia; or it may be induced by narcotics, such as belladonna or Indian hemp. Always most carefully examine the condition of the heart and lungs, for it often happens that when inflammation of these organs coexists with delirium, the other symptoms are masked by it.

In the following complaints delirium is frequently a prominent symptom, lasting for some time, and continuing both day and night—typhoid and typhus fever, acute meningitis and delirium tremens; all are acute disorders.

563. *a.* Along with delirium, often of a violent character, the patient complains of acute pain of the head, aggravated at intervals; there are intolerance of light and sound, contracted pupils, inability to sleep, great restlessness; the face is flushed, the conjunctivæ red, the head hot, the pulse quick and hard, the tongue coated, the bowels are confined, and vomiting occurs after food.

The disease is *acute meningitis.*

Acute meningitis may arise from injuries to the head, intemperance, syphilis, excessive care or anxiety. It is often produced by disease of the ear or nose, and therefore in every case examine these organs very carefully. When the meningitis has originated from such causes, it is generally suppurative, the symptoms are acute, and the duration of the disease is short.

In the early stage the patient is attacked by rigors, followed by headache and vomiting, a hot dry skin and fever. As the disease progresses, he is distressed by light and noise, the headache generally persists even after delirium has commenced, and continues until he becomes unconscious. The pupils are often at first contracted, but may be afterwards dilated, sometimes they are unequal. The temperature varies from 101° to 103°, or higher. In some cases all food is vomited as soon as taken. When the complaint is about to terminate fatally the headache lessens, twitchings or convulsions come on, the patient becomes comatose, the pulse is small and thready, the tongue dry and brown, and the patient gradually sinks in a state of coma.

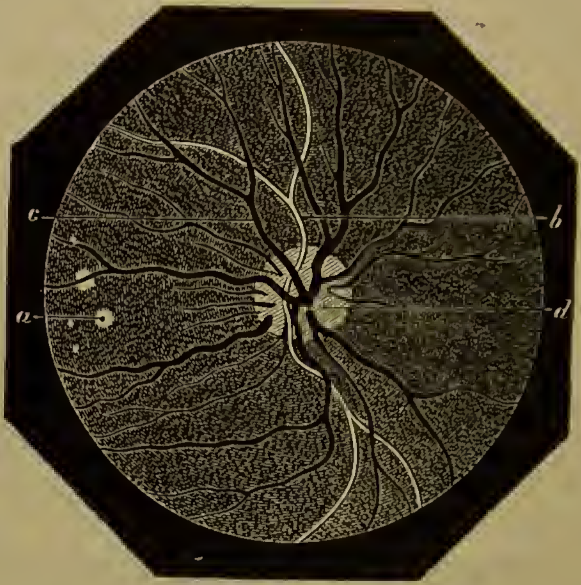
564. In the final stage the "*Cheyne-Stokes*' respiration" sometimes presents itself, as in other cerebral affections and in certain forms of cardiac disease. This consists in the respirations gradually diminishing in number and fulness until the breathing appears for a brief period to cease, after which they increase in rapidity up to a point, when the descending series again commences.

565. Typhoid fever is known from meningitis by the relaxation of the bowels, the smaller amount of headache, the absence of vomiting, the eruption on the skin, and in the slowness of the development of the complaint. In typhus fever you have muttering, not furious delirium, the strength is from the first prostrated and the characteristic eruption presents itself. Acute mania differs from meningitis in the clean tongue, the absence of headache, thirst and vomiting, and in the less rapidity of the pulse.

566. *Tubercular meningitis* is most apt to occur in children. It is almost always preceded by loss of flesh, unwillingness for exertion, cough and other signs of failing health, for some weeks or even months before the attack comes on. It will be generally found that the malady affects those who belong to families some members of which have suffered from enlargement of the lymphatic glands (scrofula) or consumption.

The first symptoms that attract notice are vomiting and constipation of the bowels, the eyebrows are contracted, the head is hot and drawn backwards, the neck rigid, the pulse quick, the temperature raised, the child fretful and suddenly screams as if in severe pain; he turns from the light and starts at any unusual sound. Older children complain from the first of severe pain in the head, and become delirious; not infrequently the disease in children is ushered in by convulsions. This is often described as the first stage. In the second the child becomes apathetic, lies in a quiet doze from which he can be roused for a few moments, and takes food when it is forced upon him, the face is pale, the eyes half open, the temperature is lower than before, the breathing often irregular, the pulse slow, sometimes irregular, the vomiting ceases, but the constipation remains, the abdomen is retracted, and there is often squinting from paralysis of one of the muscles of the eye. In the third stage the coma deepens and the patient either sinks from exhaustion or death is preceded by convulsions. The temperature is at first raised, it varies from day to day, but it never remains very high and it runs no definite course. In tubercular, as well as in simple meningitis, a broad red line is produced when the nail of the finger is drawn across the

FIG. 107.



Representation of the appearances seen with the ophthalmoscope in a case of tubercle of the choroid. *a.* Tubercle in the choroid. *b.* Artery of the retina. *c.* Veins of the retina. *d.* Optic disc. (BOUCHUT.)

skin of the forehead or abdomen. The line remains for a few minutes after the application of the finger, and is known as the *tache cérébrale.*

Tubercular meningitis occasionally attacks adults who are suffering from phthisis. Severe shooting pains of the head, accompanied by fever, delirium, and vomiting, are usually the first symptoms that attract attention. It must be remembered that constipation in these cases is often absent on account of the coexisting tubercular disease of the intestines.

567. Tubercular meningitis in children may be simulated by a state of exhaustion produced by diarrhœa or insufficient feeding. In this condition (*hydrocephaloid disease*) the child is insensible, but the fontanelle is depressed, the head is cool, the face pale, and the bowels are usually relaxed.

568. It is often difficult, and may be impossible, to distinguish between simple and tubercular meningitis. Simple meningitis is most apt to occur in adults who have been previously in good health; it often follows injuries to the head, or is preceded, or is accompanied, by disease of the internal ear. Tubercular meningitis is most common in children between two and six years of age; it follows measles and other eruptive disorders, or occurs in members of a family hereditarily predisposed to tubercular affections, and it is usually preceded by symptoms indicative of failure of the general health. The onset of simple meningitis is more sudden, its duration much shorter, it is less apt to be attended by vomiting, by paralysis of the muscles of the face, and by retraction of the head, than the tubercular form of the disease.

569. The ophthalmoscope may be useful in the diagnosis of meningitis. In tubercular meningitis it is said that the optic disc is œdematous, the retinal veins are dilated, extravasations take place, and small, circular, prominent tubercles may, in rare instances, be distinguished in the choroid (fig. 107).

570. *b.* After a short interval, in which the patient has

suffered from severe headache, giddiness and vomiting, he is attacked with excessive pain of the neck and back, increased by pressure and motion. The head is drawn backwards, the jaws are often closed, swallowing is difficult, the back is arched and painful, tetanic spasms affect the muscles. The patient becomes delirious, the pupils are contracted, the pulse and respiration are rapid and the temperature raised.

The disease is *epidemic cerebro-spinal meningitis.*

The invasion of this complaint is almost always sudden, and it usually occurs as an epidemic. The mortality is great, and it chiefly attacks the young and middle-aged, seldom persons advanced in life. An eruption of herpes or of purpura sometimes presents itself. It is not infrequently complicated with pneumonia. The temperature seldom rises above 103°.

571. Epidemic cerebro-spinal meningitis may be easily confounded with tubercular meningitis, as the head is retracted in both, but the latter is usually preceded by ill-health, or, in the case of adults, is accompanied by phthisis; whilst the former comes on suddenly and attacks persons previously healthy. In tubercular meningitis coma is a late symptom, and there is an absence of herpes, purpura, and pneumonia, which are not infrequent in cerebro-spinal fever; cerebro-spinal meningitis usually occurs in an epidemic form, which is never the case with tubercular meningitis.

572. *c.* In addition to delirium the patient is exceedingly restless and unable to sleep; he has hallucinations of the senses (he sees animals, such as beetles, mice, &c.), his hands tremble, the face is pale, the skin covered with perspiration, the pulse is feeble and quick and the tongue is moist and creamy. His history shows that he has been in the habit of drinking to excess.

The disease is *delirium tremens.*

Delirium tremens occurs in those who have been long addicted to the excessive use of alcohol, especially of spirits;

and in such persons the attack may follow an accident or operation, or occur in the course of pneumonia, erysipelas, or other inflammatory affection. When it shows itself without any exciting cause, the patient has generally complained for some time previously of inability to sleep, or he has been disturbed by dreams, has been restless and unable to apply himself to his accustomed occupations; the pulse is small and feeble, the appetite lost, the tongue foul and tremulous, the bowels either relaxed or constipated. As the disease progresses he is quite unable to sleep, is exceedingly loquacious, passing from one subject to another without any apparent connection. The temperature is raised, but in ordinary cases seldom exceeds the normal more than two or three degrees, although it may be very high in attacks of a severe character. The tremors are most evident in the hands, face and tongue, but are also present in the lower limbs when the patient attempts to walk.

In favourable cases the delirium diminishes and the patient falls into a prolonged sleep and gradually becomes convalescent. The usual duration is from three to seven or ten days. When it runs an unfavourable course, which is usually when the patient has suffered from many previous attacks or is affected with organic disease of the kidneys or liver, the delirium is constant, both night and day, is low and muttering, the tremors are excessive, the pulse weak, feeble, or intermitting, the tongue dry and brown. He becomes comatose, picks at the bedclothes and gradually sinks from exhaustion.

Pneumonia is not an infrequent complication, so that you should always examine the chest, as your attention may be easily diverted from the state of the lungs by the prominence of the nervous symptoms.

573. The chief difficulty in diagnosis is between this disease and meningitis, for the latter may also arise from drunkenness, although it is, in comparison with the former, very rare. You distinguish them by the elevated tempera-

ture, severe headache, hard, quick pulse and the active delirium of meningitis, as compared with the absence of severe pain of the head, and the restlessness, loquacity, hallucinations and tremors of delirium tremens.

574. A form of *delirium tremens* occurs in those whose occupation exposes them to lead-poisoning. In such persons you will find a blue line on the gums around the teeth, they have generally suffered from colic or palsy and the delirium is chiefly at night.

575. **C. The patient suffers from a gradual diminution of his mental powers.**

Under this head you may meet with chronic softening of the brain, chronic meningitis, and paralysis of the insane (586).

576. *a*. The intellect has been gradually impaired, especially the memory of recent events, the temper is irritable, the face dull and expressionless, there is a tendency to laugh or cry on the least emotion ; headache and giddiness are often present.

The disease is *chronic softening of the brain.*

This complaint frequently follows cerebral hæmorrhage. It may also arise from disease or obstruction of the blood-vessels of the brain by emboli or thrombosis; from general debility, excessive mental effort, tubercular or other tumours, epileptic attacks, congestion of the brain or syphilis. Where it follows hæmorrhage, or results from embolism or thrombosis, it is usually accompanied by hemiplegia.

577. In *chronic meningitis* you have nearly the same symptoms as in softening of the brain ; but there are more headache, irritability of temper, depression of mind, and occasional delirium. It is not preceded or accompanied by palsy, and there is usually a history of some injury to the head, rheumatism, syphilis, or chronic alcoholism.

SECTION II

THE PROMINENT SYMPTOMS ARE THOSE OF ALTERATIONS OF THE POWER OF MOTION

578. The muscular power may be diminished (paresis), or lost (paralysis) (579); or it may be increased and involuntary (587).

579. A. **You have diminution or loss of muscular power.** You may ascertain the loss of muscular power in different ways. Direct the patient to move the palsied part, and the muscles obey his will imperfectly or not at all; thus, if one side of the face is paralysed, you may ask him to laugh, and the mouth will be drawn to the opposite side. In some cases, you test whether the reflex action is intact, as, for instance, by tickling the sole of the foot and observing if the leg is drawn up involuntarily. In others you apply electricity to ascertain if the muscles are able to respond to that stimulus. Always remark whether, with the palsy, there are any cramps or contractions of the muscles, and, if so, at what stage of the disease they have occurred.

580. Sensation is often diminished when the power of motion is defective. The muscular sense may be impaired even when the sensibility of the skin is perfect. In this case the movements of the part affected are awkward and irregular, and can only be performed with a strong effort of the will, or when the action of the muscles is assisted by the eyesight.

In hemiplegia and paralysis of the insane the loss of motor power is a prominent symptom. It is also often present in cases of tumour of the brain.

581. *a.* The patient is paralysed on one side of the face, tongue, and body, the face is drawn to the opposite side

from that palsied, speech is imperfect, and the tip of the tongue when protruded is pushed to the affected side.

The disease is *hemiplegia.*

This complaint generally comes on suddenly, and is often preceded or accompanied by apoplexy ; in other cases there is sudden loss of speech and power of motion without the consciousness being affected. All the muscles of the side are not equally paralysed, thus there is usually much more loss of power in the lower than in the upper part of the face, the limbs may be quite incapable of movement, whilst the muscles of the eyeballs, chest, and abdomen, may remain free. There is at first a loss of sensation, but as a rule this soon returns. The reflexes are usually normal. The muscles of the palsied limbs may be relaxed at the time of the attack, or contracted if the cerebral substance is irritated by a clot.

The patient may gradually recover, the paralysis may persist, or the attack may be followed by morbid changes in the brain. The arm is usually the latest part to regain its power. The muscles at first relaxed may subsequently become contracted from changes produced by sclerosis of the lateral columns of the cord. As the lower limb recovers its power of movement, the knee-jerks are usually found to be exaggerated and ankle clonus can be readily obtained.

582. In some cases, as the paralysis disappears, involuntary movements of the muscles present themselves. They may be quick and irregular ; or slow and deliberate motions of the hands and feet take place, a condition to which the name of *Athetosis* has been applied.

583. Hemiplegia most frequently results from hæmorrhage, or from an obstruction to the supply of blood to some part of the cerebral structure by an embolus or thrombosis of the arteries, but it may also be produced by the pressure of a tumour or abscess of the brain, or it may follow chorea or an attack of epilepsy or hysteria.

When *hæmorrhage* has taken place in the brain, there is usually a loss of consciousness at the commencement of the palsy, which may occur when the patient seems in good health, the muscles of the affected limbs are often contracted, and you will frequently discover either evidence of granular disease of the kidneys, or a hard, thickened feeling of the artery at the wrist. The temperature at first falls below, but usually rises above the normal point within twenty-four hours of the attack.

When the hemiplegia has arisen from an *embolus,* the paralysis is sudden, there is rarely any loss of consciousness, and you can generally detect disease of one of the valves of the heart or of some other part of the circulating system from which an embolus might have been detached.

In case of *thrombosis* the attack is generally preceded by headache, giddiness, weakness, or partial paralysis, irritability of temper, or impairment of the mental powers; in young persons, there is often disease of the cardiac valves, or in the old the action of the heart is feeble, or its cavities are dilated.

It is always difficult, often impossible, to determine whether hæmorrhage or occlusion of the vessels is the cause of hemiplegia. Under forty years of age hæmorrhage is rare, thrombosis is usually the result of syphilis, embolism is generally accompanied by disease of the heart. Thrombosis is more generally preceded by headache, giddiness, local paralysis, loss of speech, irritability of temper, or loss of memory; it is often the result of syphilis, and occurs in persons suffering from disease of the heart; deep coma is more common after hæmorrhage; general convulsions point to hæmorrhage, local convulsions to vascular obstruction. After the first shock is over, the condition of the mental faculties and the articulation often improves if the attack has been caused by hæmorrhage, but in cases of thrombosis the mind frequently becomes enfeebled, and recovery in other respects is slow and imperfect.

584. The term *aphasia* is applied to a condition in which a person is unable to express his thoughts by means of

words. It usually presents itself in patients affected with hemiplegia of the right side of the body, and seems to arise from hæmorrhage, or some other lesion, of the third frontal convolution of the left side of the cerebrum. It must not be confounded with *aphonia* (106), in which there is a mere loss of voice from imperfect action of the vocal cords, or with the difficulty of speaking produced by paralysis of the tongue, a condition very generally met with in hemiplegia.

585. In chorea the loss of power is preceded by the irregular movements characteristic of that disease. The hemiplegia of epilepsy immediately follows a fit, usually soon disappears, but is apt to return after each attack. In hysterical paralysis, the face and speech are seldom affected, the whole side is not equally paralysed and the patient exhibits other symptoms of hysteria, whilst the loss of motor power is usually associated with a diminution or abolition of sensation.

586. *b.* The patient, with symptoms of disordered intellect, gradually loses the powers of sensation and motion, his lips and tongue are tremulous, the pupils unequal, and he is unable to pronounce his words, or does so imperfectly.

The disease is *paralysis of the insane.*

In some cases the mental changes are not well marked in the early stage, and the difficulty of articulation and the gradually increasing paralysis chiefly attract attention. Atrophy of the optic nerve is often present.

587. **B. You find increased and involuntary muscular action.**

When this affects only a part of a limb, it is named *spasm ;* when the excessive and involuntary muscular action is general and attended with unconsciousness, it is called *convulsion.* Spasms may be "*tonic*"—that is, continuous ; or "*clonic*"—that is, alternating with intervals of relaxation. Convulsions may occur at all ages and in different diseases. Children are most liable to them, and at an early period of life they often usher in eruptive fevers, or they may be produced by teething, worms, or other causes of irritation. They also occur in various diseases of the brain.

In the following diseases the whole or a large portion of the muscular system is affected with increased and involuntary action—tetanus, hydrophobia, and chorea.

588. *a.* The muscles of the body are stiff and rigid, the jaws are closed, the head is bent backwards, the eyebrows raised, the features retracted into a characteristic grin, painful spasms occur at frequent intervals, severe pain is experienced, shooting from the epigastrium to the back, the intellect is unimpaired.

The disease is *tetanus.*

Tetanus generally follows an injury to some part of the body, but it sometimes presents itself idiopathically, especially after exposure to cold and wet. It is rare below ten years of age, is most common from ten to twenty, but may occur at any time of life. The first symptom is a stiffness about the back of the neck and the lower jaw, whence the rigidity spreads over the muscles of the back, chest, and abdomen. The lower limbs soon become rigid, but the forearms and hands are usually not affected until a later period of the disease. The contracted muscles are attacked by frequent severe spasms, which at first come on only occasionally, but increase in severity and frequency as time proceeds. They occur spontaneously, but are also apt to be excited by any movement, such as the attempt to swallow, shaking of the room or bed, or even by a sudden noise. During the intervals of the spasms there is no severe pain experienced. The pulse is quick and small, the bowels confined, thirst and fever are generally present, the temperature is not at first very high, but often becomes greatly elevated (108° or 110°) just before death. When the spine is arched backwards by the strong action of the muscles, so that the body rests on the head and the heels, the condition is termed *opisthotonos;* when it is bent in the opposite direction, *emprosthotonos;* when the curvature takes place laterally it is named *pleurosthotonos.* The intellect remains undisturbed, but sleep is prevented by the frequent occurrence of the spasms. Death ensues in a large proportion of cases, and usually between the fifth and the fifteenth day after the receipt of the injury.

There are no changes to be discovered after death from tetanus, excepting distension of the vessels and minute hæmorrhages in the brain and spinal cord. In some cases the muscles have been found ruptured by the violence of the spasms. The disease was formerly supposed to depend on neuritis, but is now known to be the result of the introduction of a bacillus through the wound which is present in mould. The symptoms are believed to be caused by poisonous materials produced during the growth and multiplication of this micro-organism.

589. An overdose of strychnine produces similar symptoms; but the spasms come on suddenly, they affect the whole body at once, occur in paroxysms, are not continuous as in tetanus, while the reflex excitability presents itself early in strychnine poisoning, late in tetanus. In the early stage tetanus may be mistaken for rheumatism of the neck, but the stiffness of the jaws and the absence of swelling in the joints are sufficient to distinguish it.

590. The term "*tetany*" has been applied to a tonic contraction of the muscles which move the hands and feet. It may occur at any age, but is most common in infants and young persons. In children it is often associated with rickets, and usually follows an attack of severe diarrhœa or other exhausting disease; in adults it is more often observed in pregnancy, or where a female has been enfeebled by long-continued suckling, but it may result from exposure to cold or fatigue, while occasionally it presents itself in those who are suffering from dilatation of the stomach. The attack may be preceded by a sensation of heat or tingling in the hands and feet, but generally it comes on suddenly. In the slighter cases the fingers of both hands are firmly flexed at the

metacarpo-phalangeal joints, the thumbs being bent inwards towards the palms. The feet are extended at the ankle joints and the toes bent downwards. In severe cases the muscles of the abdomen, back, and head, may be all implicated. After a continuance of a few minutes, or hours, the contraction gradually relaxes, but may recur from time to time. During the intervals the muscles of the affected limbs are unduly sensitive both to faradaic and galvanic electricity. The disease usually ends favourably, but in cases of dilated stomach a fatal result not infrequently ensues.

591. It is distinguished from tetanus by its being preceded by diarrhœa, or exposure to cold, or by being associated with pregnancy or lactation, instead of following an injury; by the hands and feet being first affected, instead of the neck and jaw as in tetanus, by the subsidence of the symptoms and their subsequent recurrence, in place of the persistent and rapid increase in the muscular spasms of tetanus.

592. *b*. There are violent spasms of the throat on attempting to swallow, a horror of liquids, great restlessness, want of sleep, often maniacal excitement. The pulse is feeble, the skin covered with sweat, and the saliva is secreted in increased quantity. The patient has some weeks or months previously been bitten by a dog or cat.

The disease is *hydrophobia.*

In all cases the disease is the result of the introduction of a virus in the saliva of a rabid animal. The period of incubation before the appearance of the characteristic symptoms varies from one to three months, but in some cases it is much longer. The disease runs its course in from two to four days. At first any attempt at swallowing produces a severe spasm, and this is intensified until even the sight of a liquid is sufficient to produce it. The temperature is generally raised only two or three degrees, but it occasionally reaches 104° or 105°. Delirium comes on towards the termination of the disease.

After death, changes can be discovered with the microscope in the cortex of the hemispheres, in the medulla oblongata and the spinal cord, consisting of dilatation of the vessels, small hæmorrhages, and accumulations of leucocytes. The disease is believed to be produced by a microbe contained in the saliva of the rabid animal, but it has not as yet been identified. The virus is found to be present in the spinal cord of animals who have died of the disease.

593. *c.* The muscles are affected with a disorderly, jerking, painless, involuntary motion; the tongue is projected from the mouth with a jerk, and as suddenly withdrawn; the limbs cannot be kept at rest, the muscles of the face twitch, the speech is often hesitating, the face is usually listless and vacant.

The disease is *chorea.*

This disease usually attacks persons from five to fifteen years of age, often follows or precedes acute rheumatism, is most common in females, and is very apt to recur, but it occasionally occurs in persons advanced in life. It comes on gradually, and the patient has generally been weak and anæmic for some time before the choreic motions are observed. The first attack often follows a fright or some other mental excitement, in other instances it shows itself during pregnancy, usually about the third month. The hands and arms are first affected, and often to a very slight degree, but the unsteadiness increases and gradually extends to other parts, each movement being short in duration, quick and irregular. In severe cases the movements are very forcible and the limbs are jerked about with great violence. Usually they cease during sleep, are increased by any excitement, and by efforts at voluntary motion. Occasionally only one side of the body is attacked, but in most instances both are simultaneously affected. In many there is a systolic murmur at the mitral valve. The urine is often of high specific gravity, and contains an excessive amount of urea.

In very severe cases the movements are excessive, and do not entirely cease during sleep. The patient is unable to take food, the appetite is lost, emaciation proceeds rapidly, the pulse is quick and feeble, the temperature rises, delirium shows itself, and the patient sinks from exhaustion. Such cases are most apt to occur during pregnancy. Whenever in chorea there is a rise of temperature with delirium, carefully examine the heart and lungs, for pericarditis or pneumonia may be present and their usual indications masked by the chorea. The ordinary length of an attack is about two months, but fatal cases are generally of much shorter duration. In some instances the irregular movements are followed by paralysis, which is, however, rarely of long duration.

No changes can be discovered in the nervous centres in fatal cases, but lymph is generally found upon the mitral valve of the heart.

594. Choreic motions occur occasionally in hysterical persons, and difficulty may be experienced in distinguishing such cases from chorea. In hysteria the movements are more sudden, they are more regular, are not so constant as in chorea, and the patient exhibits other symptoms of the disease.

SECTION III

YOU FIND THAT THE PATIENT SUFFERS FROM SEVERE PAIN IN THE HEAD WITHOUT FEVER, THE INTELLECT AND POWER OF MOTION BEING UNAFFECTED

595. Headache may arise from various causes, independently of brain disease; thus it is a common symptom in dyspepsia, anæmia, hysteria, uræmia, rheumatism, syphilis, neuralgia, migraine, fevers, and many other disorders.

596. *Dyspeptic headache* is recognised by the pain being aggravated after food, it is accompanied by obstinate con-

stipation, bilious vomiting, acidity, or other signs of disordered digestion. The pain in *anæmia* is often neuralgic, and is associated with general debility, pallor of the skin and lips, palpitation, and other signs of a deficiency of blood. Persons who suffer from *hysteria* are very liable to severe headache, usually localised in one part of the skull. It is attended with other symptoms of hysteria, is aggravated by excitement and fatigue, and is usually increased at the catamenial periods. The pain in *uræmia* is usually confined to the forehead, is often very severe, and is accompanied by the changes in the urine and general health of the patient characteristic of disease of the kidneys. In *rheumatism* the pain is generally diffused over the whole scalp which is tender on pressure, and the patient has usually suffered previously from rheumatic pains in other parts of the body. In *syphilitic headache* the pain is very severe, it is constant, but is aggravated at nights. There are small elevations on the scalp which are intensely tender on pressure. The severity of the pain and the loss of sleep soon reduce the strength of the patient, and often render him depressed in mind as well as in body. *Neuralgia* is chiefly felt in the course of one of the nerves of the face or head, and the pain is liable to periodical exacerbations. The most common seat of the pain is in the temple, and you will often find disease of the teeth or gums. Sometimes you will be able to trace the complaint to gout or ague.

597. Many persons habitually suffer from what are termed "sick headaches," or "migraine." The complaint is hereditary, generally commences about the age of puberty, and often persists during the whole life of the patient. The attacks may occur frequently, or only occasionally, and the patient in the intervals may enjoy good health or he may suffer from dyspepsia. In most cases there is chronic constipation. An attack may be induced by an error in diet, by worry or care, or by fatigue of body or mind. It is often ushered in by flashes of light or by bright zigzags before the eyes, or by the passage of large

quantities of clear urine. The pain is referred to one side of the head, but may affect the temples, eyes, or forehead. In most instances nausea and vomiting of a bilious fluid take place, with relief of the headache, and the patient gradually recovers from the attack.

Various chronic diseases of the brain and its membranes are attended with pain, but they must be diagnosed by their other symptoms.

598. *Tumours of the brain* are very difficult of diagnosis, the symptoms varying according to the nature, size, and position of the new growth. They are more common in the male sex, may occur at any age, the onset and the progress of the disease being always slow and gradual. In some cases there is a history of an injury to the skull before the first appearance of the symptoms.

Cerebral tumours are attended with headache, which is often very severe and liable to paroxysmal exacerbations; the pain is frequently confined to one part of the head; it is usually referred to the occiput in case the growth is situated below the tentorium; it is often attended by giddiness, which may be constant and distressing. In some cases the pain is localised over the part in which the tumour is situated, but in others it is diffused generally over the whole head. The pain is often increased by percussion, and this is especially the case when the pain is most intense in one locality.

In the majority of cases there is well-marked optic neuritis in both eyes, which may go on to atrophy. As the sight may be unimpaired in case the neuritis is moderate, the use of the ophthalmoscope ought never to be neglected, wherever there is any suspicion that cerebral tumour may be present. It has been stated that the temperature of the scalp is increased in cases of cerebral tumour, and that this is most marked near to the situation of the new growth. There is often paralysis of one of the cranial nerves, beginning slowly and increasing gradually, the third nerve being most frequently implicated. In other instances there may be loss of smell or hearing, or hemiplegia may be present. Local or general convulsions, resembling epileptic attacks, may form the most prominent feature of the case, whilst in others frequent vomiting, not preceded by nausea, coming on suddenly when the stomach is empty, and very rebellious to treatment, is a common accompaniment of the disease. Loss of memory and slowness of speech are not infrequent, and coma or stupor often precedes death.

599. You cannot determine the nature of a cerebral tumour by the symptoms it produces, but it is well to remember that tubercular tumours are chiefly confined to children; glioma is most liable to occur in children and young persons; whilst cancer is rarely met with except in those advanced in life, or where there are tumours of this kind in other organs of the body.

600. *Syphilis* affects the brain and spinal cord, either by producing disease of the coats of the arteries or by the formation of tumours. As a result of these morbid changes, you may meet with paralysis, either of the whole side (hemiplegia), of the lower limbs (paraplegia), or of one or more of the cranial nerves; in other cases epileptiform convulsions occur. When a *young* person who has suffered from syphilis, and who has no disease of the heart or kidneys, is attacked with hemiplegia, you are justified in concluding that the disease is syphilitic. Dr. Hughlings Jackson remarks: "With regard to palsies of the cranial nerves, our impression is that the suspicion is greatest when the fifth is involved; next when the portio dura nerve—especially if there be also complete deafness without discharge from the ear; next the third, then the sixth, and lastly the eighth and ninth. If several of the nerves are involved, one after another, or at the same time, the suspicion is greater still, and all the more if the palsies be limited to one side. Convulsions of any sort may be due to syphilitic disease of the brain, but syphilis is most frequently associated with fits which begin by spasm in one hand, one foot,

or one side of the face, and which are not followed by hemiplegia for a varying time." As patients often deny they have suffered from syphilis, you should always examine in suspected cases for nodes on the head and shins, holes in the palate, the presence of a coppery rash upon the skin, and the results of iritis.

601. The diagnosis of cerebral abscess is of great importance, as recent experience has shown that many of these cases are capable of being successfully treated by surgical operations. The abscess may be acute or chronic. In the *acute* there are generally severe headache, vomiting, fever, and in some cases repeated rigors, followed by delirium, convulsions, and occasionally by paralysis. In the *chronic* form the symptoms may be for a length of time very obscure, but usually headache is complained of, increasing as the disease progresses. The pain is aggravated by muscular efforts or by mental exertion, becomes more constant and intense as the more acute stage supervenes, when restlessness, delirium, and fever present themselves. In both forms optic neuritis may be present, and its discovery is most important in the diagnosis of the complaint. It is necessary to bear in mind that cerebral abscess rarely occurs without suppuration being present in some other organ, and is most commonly met with in disease of the ear and after accidents to the skull. It may also follow disease of the nose or frontal sinuses, and syphilitic affection of the bones of the skull. It sometimes accompanies pyæmia, and has been met with as the result of fœtid bronchitis and dilated bronchial tubes. In disease of the ear, the abscess is most commonly situated in the sphenoidal lobe or in the cerebellum.

602. Chronic abscess may be confounded with a tumour of the brain. It is, however, almost always secondary to disease of the ear, nose, or bones of the skull. The headache comes on more suddenly; it is usually attended with fever; drowsiness, convulsions, and coma follow more quickly after the pain of the head than is the case with

tumour, whilst optic neuritis and paralysis of one or more of the cranial nerves are more common in tumour than in abscess.

603. In the diagnosis of all forms of cerebral tumour the coexistence of severe headache and double optic neuritis are the most important points, but these may also present themselves together in kidney disease, lead-poisoning, and even in some cases of anæmia. In chronic renal disease they are associated with the presence of albumen and casts in the urine, hypertrophy of the heart, increased second sound of the heart, and a large full pulse (227). In lead-poisoning they are accompanied, or preceded, by attacks of colic, wrist-drop, or anæmia, and there is a blue line around the gums. Cases of anæmia soon improve, when treated with rest, good diet, and some preparation of iron. In all cases of cerebral tumour, remember that the onset is slow, and the progress of the disease is gradual.

604. Hysteria is a malady that must be borne in mind, not only in the investigation of affections of the brain and spinal cord, but also in almost every other disease that may come beneath your notice. In persons affected with it the functions of the nervous system may present such marked alterations that you are led to infer the existence of serious organic changes in the nervous centres, whilst in others its manifestations may mimic the symptoms of other and more serious maladies. The disease seems to be connected with a diminution or abolition of the control normally exercised by the will, so that any excitant produces its effects in an exaggerated form. It is chiefly met with in the female, although it occasionally presents itself in the other sex; it is often hereditary, and is unconnected with any structural change, either in the nervous system or in any other of the organs of the body.

The subjects of hysteria are usually of an irritable disposition and are easily roused to violent expressions of feeling, so that tears and laughter readily present themselves on the most trivial excitement, and often alternate with each other. In some the power of sensation is greatly intensified, and the slightest touch upon the skin produces pain, which may be relieved or may be increased by deeper pressure; or severe attacks of neuralgia may occur in the head, the left side below the heart, over the spinal bones, or over one of the superficial nerves. In other cases the eyes or the ears may be abnormally sensitive, or loss of sight may occur, without any lesion in the eye itself. Occasionally sensation is entirely lost, either in one limb or in half of the body (*hemianæsthesia*), without any alteration of the power of motion in the affected part.

The motor powers of the patient may present the only evidence of the disorder. Loss of the power of speech (*aphonia*) is the most common form in which this is exhibited, the patient being able to speak only in a whisper, although in some instances she is able to sing, or even to scream under any sudden excitement. Paraplegia or hemiplegia occasionally takes place, or there may be only a partial loss of power, and the patient is able to shuffle along when she attempts to walk. The muscles of a limb in some instances become rigid, or the thumb may be bent inwards, or the fingers closely contracted together. In others general convulsions take place, and attacks are experienced so closely resembling epilepsy that it is very difficult to distinguish them from that disease.

The viscera often present the most marked manifestations of disordered action. One of the most common symptoms, and one that often ushers in the complaint, is a sensation of choking, which is compared to the feeling as if a ball were sticking in the throat (*globus hystericus*). Severe attacks of palpitation or of very hurried breathing are often met with, whilst complete loss of appetite, frequent vomiting, or obstinate constipation of the bowels may form the prominent feature in the case. Retention of urine is not uncommon, but incontinence of urine or loss of control over the rectum is very rarely or never observed in a pure case of hysteria.

605. The student will be liable to confound hysteria with serious diseases of all kinds, unless he carefully investigates the history of the malady as well as the symptoms and physical signs accompanying it, but he must bear in mind that an opposite mistake may readily take place. A hysterical female, for instance, may have some organic disease, such as cerebral tumour, but on account of the nervous symptoms the more serious malady may be overlooked.

606. The term *Neurasthenia* is applied to a condition of the nervous system that presents many points of resemblance with hysteria. You will frequently meet with it in private practice, but will seldom encounter it in the wards of a hospital. It occurs most commonly in men who have been exposed to severe mental strain or business troubles, or in those of either sex who have suffered from long continued grief and anxiety. The most marked symptom is the gradual decrease in the power of concentrating the mind on any particular subject, and mental effort, however slight, is apt to produce a feeling of pain or weight on the top of the head attended with confusion of thought. The temper is usually irritable, the mind irresolute and desponding, and in most there is sleeplessness, or the sleep is broken and unrefreshing. In some, disorders of the digestive organs constitute the chief subject of complaint, and the patient suffers from loss of appetite, palpitation, flatulence, pain after food, and constipation of the bowels; in others, attacks of neuralgia in different parts of the body, muscular feebleness, and incapability of exertion are the most prominent symptoms.

SECTION IV

YOU FIND THE HEAD MUCH INCREASED IN SIZE

607. There are only two diseases in this class—viz., chronic hydrocephalus, and rickets.

608. The skull is much increased in size, especially at its upper part; the fontanelles are unclosed, the eyes protrude and are directed downwards, and the face looks small and shrunken.

The disease is *chronic hydrocephalus.*

Chronic hydrocephalus may be congenital or it may show itself within a few months after birth. The enlarged skull has a globular shape and projects over the upper part of the face, the fontanelles are large and distended, and fluctuation can be often felt in them. The skin of the scalp looks thin and stretched and numerous large veins can be seen ramifying on its surface. In the early stage the child may appear in perfect health, but, as the disease progresses, it becomes irascible, feeble in body and mind, and subject to convulsions. Nutrition is impaired, the patient is usually unable to walk, the senses are dull; optic atrophy may be often detected with the ophthalmoscope. The disease usually begins in children below six months of age.

609. The head may be increased in size in rickets from thickening of the bone, but in this condition it is square-shaped, not globular as in hydrocephalus, the mental faculties are not defective, the eyeballs are not displaced downwards, nodules can be felt at the junction of the ribs and their cartilages, the wrists are thickened, and the spleen is usually enlarged.

CHAPTER XIII

DISEASES OF THE SPINAL CORD

The spinal cord is liable to the same diseases as the brain, but there is considerable difference in the frequency with which these organs are affected by them. Thus hæmorrhage, which is so frequently met with in the brain, is comparatively rare in the cord, whilst sclerosis is much more common in the latter than in the former.

610. Spinal Meningitis, or inflammation of the membranes of the spinal cord, may be confined to the dura mater, or it may commence in the pia mater and arachnoid, and afterwards affect the dura mater. Inflammation of the dura mater is usually attended by the formation of pus, and is in most cases the result of disease of the vertebræ. There is often considerable exudation between the bones and the membrane, which may be sufficient in amount to cause compression of the cord. When the pia mater and arachnoid are inflamed, the membranes exhibit increased vascularity and thickening, or they are covered with exudation, the spinal fluid being increased in quantity and often purulent. In tubercular cases tubercles can be detected in the exudation.

611. Myelitis, or inflammation of the spinal cord, usually ends in softening; the appearances are similar to those of cerebral softening. The morbid action ordinarily commences in the grey matter; when hæmorrhage is present it is usually the result, and not the cause, of the softening. Myelitis is more frequent in the male sex, and

is most common in the middle period of life. It usually results from (1) exposure to wet and cold; (2) fatigue; (3) injuries to the spine; (4) compression by a tumour or exudation arising from diseased vertebræ. It occasionally follows eruptive diseases, such as small-pox, acute rheumatism, or pyæmia.

612. Infantile Spinal Paralysis.—This arises from acute inflammation of the anterior cornua of the spinal cord. It may be localised or diffused, the cervical or lumbar enlargement being usually the chief seat of the disease. Microscopically, in the early stage the vessels of the affected part are dilated, nucleated cells are diffused throughout the tissue, and the ganglion cells are swollen. In long-standing cases the ganglion cells have disappeared and their place is occupied by connective tissue, and the motor nerves connected with the diseased structure are in a state of atrophy. In the muscles of the paralysed limbs there is an increase of the connective tissue between the muscular fibres, whilst the latter are diminished in bulk or are in a state of fatty degeneration.

The disease occurs at all ages, but is especially frequent in children under three years of age. It is said to be more common in the summer than in the colder months of the year. It has been ascribed to exposure to wet and cold, and occasionally presents itself after one of the acute febrile diseases of childhood.

613. Degeneration often attacks portions of the spinal cord; it is termed "*primary degeneration*" when it originates without any previous lesion of the fibres above or below the part at which it commences.

The nutrition of each nerve fibre probably depends upon the ganglion cell with which it is connected, and consequently, if the connection is severed, degeneration commences. The medullary sheath breaks up, the nuclei in the outer sheath increase in number, and subsequently the axis cylinder wastes and is absorbed. In case of recovery, regeneration of the nerve fibres may take place, but otherwise they are replaced by an increased growth of connective tissue. This process presents itself in the nerve fibres of the spinal cord as well as in the peripheral nerves of the body, and changes so produced are named *descending* or *ascending degeneration*, according to the direction in which the morbid process extends. The pyramidal tracts which conduct the motor impulses from the brain are apt to present degenerative changes (*descending degeneration*) whenever disease has affected the cortex or the fibres which proceed from it to the pyramids. If the posterior columns are interrupted at any portion of their course, degeneration of the fibres proceeds upwards; or if there be a lesion at the place of origin of the cerebellar tract, degeneration passes upwards along the fibres of that tract, forming an *ascending degeneration.* It must be remembered that in all instances the degeneration of the nerve fibres proceeds in the same direction in which they conduct impulses in a healthy state.

614. In Locomotor Ataxia, atrophy and degeneration of the posterior columns and of the posterior roots of the spinal nerves, sometimes of the posterior cornua of the grey matter, have been found on microscopic examination. The membranes are generally normal. The morbid change appears always to commence at the surface, and to spread towards the centre. Syphilis is supposed by many to be the chief predisposing cause of the disease. The medullary sheath of the nerves first shows signs of degeneration, and this is followed by that of the axis cylinders; as the nerve elements disappear they are replaced by an increased amount of newly formed connective tissue.

615. In the *hereditary form of ataxia* (Friedreich's disease) the sclerosis is not confined to the posterior columns, but also affects the lateral and pyramidal tracts.

616. When degeneration occurs in the lateral columns of the cord it is termed *lateral sclerosis.* It may follow cerebral hæmorrhage, softening of the brain, &c., but occasionally it takes place, like degeneration of other parts of the nervous centres, without apparent cause.

617. In Chronic Muscular Atrophy, isolated parts of

the anterior cornua of the spinal cord, and of the motor nerves proceeding from them, have been found in a state of chronic inflammation. The muscular structure of the affected limbs is completely wasted; it appears pale and soft, and microscopically the fibrils seem fatty or granular. The disease is most frequent in the male sex, and usually occurs in middle life. It is occasionally hereditary, its most common causes being exposure to wet and cold, injuries to the spine, and syphilis. In some instances muscular atrophy has been observed, where no change could be discovered in the spinal cord.

When the disease affects the medulla oblongata the muscles of the tongue, lips, pharynx, and larynx are paralysed and waste (*bulbar paralysis*).

In the diagnosis of the diseases of the spinal cord you have often to rely on any changes in the powers of sensation and motion that may present themselves in the various parts to which the nerves proceeding from it are distributed.

618. It may be necessary for you to ascertain if the power of sensation is in a normal state, as regards ordinary feeling, as well as the ability of recognising heat, cold, or pain. You ascertain the state of ordinary sensation by measuring with a pair of compasses on some portion of the skin the smallest distance to which the points can be separated whilst the patient is sensible of the contact of both. The sensibility to temperature can be tested by the application of tubes filled with water at different degrees of heat, whilst the capability of feeling pain may be ascertained by a slight prick with the point of a needle.

619. Where there is paralysis it is often of use to measure the actual loss of power, by comparing the amount possessed by the affected limb with that of the opposite side. This may be done in the case of the upper extremity by making the patient grasp your hand with each of his in turn and noting the amount of pressure he is able to exert. For more exact measurement you may employ a dynamo-

meter, which is an oval steel spring that registers the force used in its compression by an index attached to a scale. In the case of the lower limbs, observe how the patient walks or instruct him to flex or extend his leg whilst you oppose the effort with your hands placed upon the limb.

620. Every muscular movement requires the co-operation of various muscles, but if the balance between them is impaired, the movements become irregular, or are imperfectly executed, although each muscle may be able of itself to contract with its normal force. The jerky or unsteady action thus produced is named inco-ordination, or ataxy, and the best illustration of it is found in the disease named locomotor ataxia. In order to test the slighter degrees of inco-ordination, let the patient walk along a line and observe if he is able to keep a straight course when attempting to do so, or see if he can maintain his balance when he stands with his feet placed close together whilst his eyes are shut. As regards the arms, let him close his eyes and then tell him to touch some point of his face or head with his fingers.

621. The condition of the reflex actions often throws great light upon cases that may be otherwise very obscure. The cutaneous reflex actions may be excited on almost any part of the skin. Thus on tickling the sole of the foot the limb is quickly drawn upwards; the gluteal muscles respond to irritation of the skin over them; retraction of the testis takes place on stimulation of the inner side of the thigh; the abdominal muscles are brought into action by stroking the skin over the outer border of the rectus; those in the epigastrium by irritation of the surface over the cartilages of the lower ribs; whilst the muscles attached to the scapula are affected by acting on the skin over them. These skin reflexes are often of value in localising diseases of the spinal cord, and Dr. Gowers has stated that they correspond with different segments of the cord. He refers the plantar reflex to the part of the cord corresponding to the first, second, and third sacral nerves; the gluteal to

that of the fourth and fifth lumbar and first sacral nerves; the cremasteric to that of the first, second, and third lumbar nerves; the abdominal to the area extending from the eighth dorsal to the first lumbar nerves; the epigastric to that from the fourth to the seventh dorsal nerves; the scapular to that from the fifth cervical to the first dorsal nerves.

622. The condition of the "tendon reflexes" is equally important, and the patellar tendon is usually selected for the experiment. The patient should place one knee over the other, whilst you give a smart tap on the tendon below the patella. In the normal state the leg will be immediately jerked upwards, but in locomotor ataxia and some other affections it remains immovable. When the muscular irritability is excessive you may obtain what is termed the "foot clonus" by placing one hand below the knee of the patient, whilst with the other applied to the upper part of the sole of the foot you force the foot backwards. A quick contraction of the muscles of the leg is produced, and if you keep up the pressure on the foot a series of spasmodic contractions takes place. Or you may place the finger across the quadriceps tendon just above the patella, and push the bone downwards. If the finger be then percussed with the fingers of the opposite hand a sudden contraction is produced that jerks the patella upwards.

623. It was before mentioned, that after a lesion of a nerve its fibres beyond the injury undergo degeneration, and you are able to ascertain if this has taken place by the employment of the electrical current. In the normal state a contraction of a muscle is produced whenever either the induced or voltaic current is passed through the nerve distributed to a muscle or through the muscle itself, the contraction being continuous with the induced current, but only taking place if the voltaic is used when the direction of the current is changed. But when the nerve has undergone degeneration, what is termed the "*reaction of degeneration*" is observed, "which is characterised essentially by the diminution and loss of faradic excitability in both

nerves and muscles, whilst the galvanic excitability of the latter remains unimpaired, is sometimes notably increased, and always undergoes definite qualitative modifications."*

The symptoms that should direct your attention to the spinal cord are pains of the back, round the abdomen, or shooting suddenly down the legs or arms in the direction of the nerves, partial or complete loss of motion or sensation in one or both of the upper or lower extremities, or loss of power over the bladder or rectum.

624. In every affection of the cord carefully examine the spine, and repeat your examination from time to time if the symptoms persist and you fail on the first occasion to discover a cause sufficient to account for them. In the earlier period of life, caries is the most common disease of the bones that leads to alterations in the cord, but in older persons they may arise from an aneurysm or from a new growth. Trace down the line of the spinous processes with your finger, and observe if there is a deformity or marked tenderness in any part of the spine; if so, ascertain whether there is thickening on the side of the affected vertebræ. Symptoms pointing to caries may be present before any deformity takes place, but in such cases you may discover some part that is tender, not only to direct but to lateral pressure. In persons suffering from hysteria and neurasthenia you will frequently find tender spots over the spinal column without any disease of the bones, but you distinguish such by the presence of other symptoms of these affections and the absence of deformity and of neuralgic pains proceeding from the tender parts. A mere lateral curvature very seldom produces disease of the cord, although it may give rise to neuralgic pains from pressure on the nerves. In all cases of disease of the spinal cord arising from pressure, neuralgic pains constitute the earliest symptoms, and often precede for a considerable time loss of power and other indications of disease of the nervous structures.

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* "Electro-therapeutics," by Wilhelm Erb, M.D.

First ascertain if the complaint has commenced suddenly or gradually. If acutely, begin at (625); if gradually, pass on to (633).

SECTION I

Acute Diseases of the Spinal Cord

625. The cases under this head usually met with are cerebro-spinal meningitis (570), acute myelitis, acute spinal meningitis, and infantile paralysis. In acute myelitis and infantile paralysis the early appearance of paralysis constitutes the prominent symptom.

626. *a.* The patient has been attacked with numbness, or tingling, and diminished power of motion, followed in a few hours or days by complete paralysis of the lower limbs, retention or dribbling away of the urine, and loss of power over the rectum. The bowels are confined, the pulse quick and small, and the temperature elevated; but there is not necessarily any pain of the back or limbs.

The disease is *acute myelitis.*

Acute myelitis may occur at all ages, but is most common between ten and forty. The usual cause of the complaint is an injury or disease of the spine, but in rare cases it arises from exposure to wet and cold, and in some instances follows typhoid, small-pox, or measles. The disease occurs either as a diffuse inflammation or as a local transverse affection of the cord. The former, which is rare, is more rapid in its course, and is attended with higher fever. The local transverse myelitis may be preceded by a sensation of tingling, numbness, or slight loss of power in the limbs, but complete loss of the power of motion generally takes place in a few hours or days. There is a loss of sensation in the affected part, and often a painful sense of constriction (girdle pain), which is most commonly felt between the umbilicus and the ensiform cartilage.

The extent of the paralysis of course depends on the part of the cord affected. Thus, if the inflammation has been confined to the lumbar region, the lower limbs are alone powerless; whereas if it has implicated the cervical enlargement, the arms and intercostal muscles will be also paralysed, and the breathing will be carried on by the diaphragm alone. The part affected may be often discovered by passing a sponge wet with hot water down the spine, the sensation of heat being replaced by pain over the seat of the disease. There is generally a zone of hyperæsthesia immediately above the part at which the paralysis commences. The temperature of the paralysed parts is at first increased, but it afterwards sinks below the normal point. The affected muscles gradually waste. Not infrequently the paralysis is followed by spastic paraplegia. There is at first retention, but this is soon followed by dribbling away of the urine, and the stools are passed involuntarily from paralysis of the sphincter. There is an early tendency to the formation of bed sores. The state of the reflexes varies according to the position of the lesion. If the lumbar enlargement is implicated there is a loss of all the reflex actions below it. If above this point, the reflex actions, at first abolished, soon become excessive. When in the cervical region they may be lost in the arms and be excessive in the legs.

Acute myelitis may arise from disease of the bones, and therefore, in every case the spinal column should be carefully and repeatedly examined. In such instances the loss of power is usually preceded by severe pain, and this is especially so in cancer of the spine, which occasionally shows itself after the breast or other organ has been affected with malignant disease.

627. *Hæmorrhage into the spinal cord* is very rare, but it occasionally occurs and rapidly produces paralysis. It is distinguished from acute myelitis by the suddenness with which the loss of motion takes place, by its being often preceded or accompanied by severe pain, and by the absence of any of the ordinary causes of myelitis.

628. Paraplegia occasionally presents itself suddenly as a symptom of hysteria. The loss of motor power is, however, rarely complete, the knee-jerks are not excessive, there is often retention of urine, but never involuntary passing of the urine or fæces, and there is usually a history or other indications of hysteria. Always, however, bear in mind that a hysterical person may become affected with myelitis, so that any indication of spinal mischief should be carefully examined and watched until it has disappeared.

629. *Acute spinal meningitis* is a rare disease. It usually commences with severe pain of the back, elevation of the temperature, and often with rigors. The pain of the back is constant and severe, is increased by pressure over the spine, and by the application of a sponge wrung out of hot water; it is quickly followed by pains extending along the nerves, and afterwards by spasms and rigidity of the muscles of the back and neck. The reflex actions are at first increased. The pains and spasms are followed by paralysis of the affected parts.

630. It is distinguished from acute myelitis by the severe pains of the back and limbs, the rigidity of the muscles of the spine, hyperæsthesia of the skin, and increased sensitiveness of the muscles, especially of the lower extremities.

631. As acute spinal meningitis is accompanied by rigidity and spasms of the muscles it may be confounded with tetanus. The latter, however, usually follows an accident, the temperature at first is not elevated, stiffness of the jaw is an early symptom, whilst in acute spinal meningitis there is generally an early rise of temperature, there are severe pains of the back and limbs without an affection of the jaw, and the paroxysms of pain are markedly increased by efforts at motion.

632. *b.* After an illness of some hours or days, in which either fever, stupor, or convulsions have formed the prominent symptom, the patient (a child) is discovered to have lost its power of moving one or more

of its limbs, or some part of a limb. The bladder and rectum are unaffected.

The disease is *acute anterior polio-myelitis* (*infantile paralysis*).

The complaint is most common in children below two years of age, and often follows dentition, eruptive fevers, and exposure to cold and damp. It occasionally affects adults, and is most frequently met with in the warmer months of the year. Pains of the muscles are sometimes complained of in the early period, and the temperature is elevated (100° to 103°). In children the early symptoms preceding the paralysis are rarely recognised, and the loss of power is commonly discovered by accident. Partial or complete recovery generally ensues, but any muscles that remain paralysed quickly waste and become atrophied. Improvement usually first takes place in the parts that have been least affected, but it is rare for all the paralysed muscles to recover completely. Where a limb in a child remains paralysed, growth is checked, and the bones as well as the muscles remain stunted. There is no loss of sensation at any period; the affected muscles at first present an increase of the voltaic, but a decrease of faradic irritability, and the latter is soon lost in such of them as are not capable of eventual recovery. The cutaneous and muscular reflexes are absent in the affected limbs. Bed-sores do not occur, but

FIG. 108.

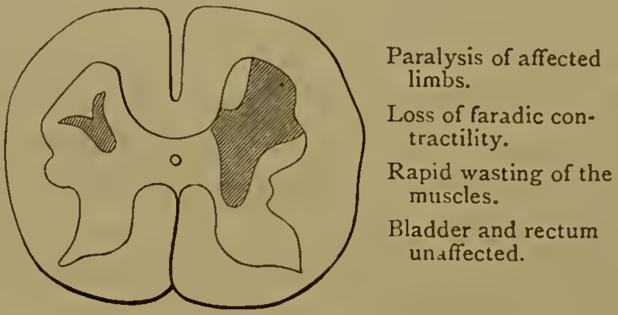

Paralysis of affected limbs.
Loss of faradic contractility.
Rapid wasting of the muscles.
Bladder and rectum unaffected.

Diagram of a section of the spinal cord in infantile paralysis. (ROTH.)

deformities of the limbs are often produced by the shortening of the muscles. The disease differs from acute myelitis in the loss of the faradic irritability and of the reflexes, in the sphincters being unaffected, and in the rapid wasting of the implicated muscles.

SECTION II

CHRONIC DISEASES OF THE SPINAL CORD

633. First observe if there is any trembling of the affected muscles. If this is not the case, begin at (634); if there is trembling, pass on to (648).

A. There is no trembling of the affected parts.

634. In all of the following diseases loss of motor power, without well-marked trembling, is the prominent symptom: Chronic myelitis, locomotor ataxia, glosso-labio-laryngeal paralysis, multiple neuritis, and progressive muscular atrophy.

635. *a.* After slight numbness or altered sensation in the legs and feet, a loss of motion and sensation has been experienced in both of the lower limbs. The patient drags his legs when walking, or loses all power over them, and also over the bladder and rectum, but involuntary startings of the limbs are often present. When confined to bed, bed-sores are apt to form.

The disease is *chronic myelitis* (*paraplegia*).

The disease is most common in the male, and in early and middle life. It chiefly arises from exposure to cold, over-exertion and, in some cases, from chronic alcoholism, gout, or constitutional syphilis. The disease, excepting when it follows an attack of acute myelitis, always begins gradually and the symptoms are slowly developed. The extent of the palsy depends on the amount of disease in the cord; only the lower limbs, or both the upper and lower, may be affected, according to the seat of the lesion. The urine is generally ammoniacal, and deposits a thick ropy mucus. Severe pain is rare, but pain or a sense of constriction around the body ("girdle pain") is often present. Sensation may be unaffected, or numbness may be a prominent symptom. As the disease progresses, there is usually an increase in the superficial and muscular reflexes, and ankle clonus may be obtained.

636. Chronic myelitis is distinguished from the effects of compression of the cord by the neuralgic pains that accompany the early stage of the latter, and by the absence of deformity of the spine. In hysterical paraplegia the paralysis comes on more rapidly, it is seldom complete, there is never involuntary passage of the urine or fæces, it varies in amount at different periods, and other hysterical symptoms are present. You must remember that a hysterical female may be affected with chronic myelitis, so that you must not depend for your diagnosis entirely on the presence of other hysterical indications.

637. *b.* There is paralysis of the extensor muscles of the hands and feet, attended with pains and tenderness of the muscles of the leg and forearm, there is diminution or loss of sensation, and loss of the knee-jerks, and the affected muscles gradually waste.

The disease is *multiple neuritis.*

The disease is in most cases due to the abuse of alcohol, and is commonly met with in females of early middle age. Occasionally it arises from poisoning by lead, copper, or arsenic, or it may follow diphtheria or some other infectious disorder. It is probably also the cause of the most prominent symptoms of *beri-beri.* The paralysis affects the extensors more than the flexors of the hands and feet, and is generally preceded by a feeling of numbness or tingling; the patient loses the power of standing, the feet, as she lies in bed are extended, and the hands droop downwards. Severe pains are experienced in the muscles of the legs and forearms, which are tender upon pressure, the trunks of the nerves of the affected parts are also tender to the touch. The muscles gradually waste, the skin reflexes may be lost or increased, the knee-jerks are usually absent. The functions of the bladder generally escape injury. The excitability to faradic electricity is greatly diminished or lost. In most cases there is a loss of memory and the patient is often liable to delusions.

The symptoms in most cases gradually increase for three to six weeks, and show signs of improvement after two or more months. The temperature is at first somewhat raised, but soon falls to or below the normal. Recovery slowly takes place in the majority of instances, but occasionally, in acute cases, death ensues from interference with the respiration.

638. You may confound multiple neuritis arising from alcoholism with chronic myelitis, as there is also in that disease a loss of power of the limbs. It may be distinguished by the history of intemperance, the severe pains that affect the nerves and muscles, the excessive tenderness of the limbs on pressure, the abolition of the knee-jerks, and the escape of the sphincters from paralysis.

639. *c.* The patient has an awkward, unsteady gait, the feet are thrown outward and forward, the heels first coming to the ground; when his eyes are closed he staggers and stumbles; when sitting he can move his legs strongly; sensation in the affected limbs is very imperfect. He gradually loses the power of motion and sensation; the arms are usually affected at a later period than the legs.

The disease is *locomotor ataxia.*

Locomotor ataxia is rare in the female, is most common between the ages of twenty and fifty, and in many cases seems to be the consequence of syphilis. In rare instances it follows an injury or concussion of the spine, and occasionally the symptoms show themselves after exposure to wet and cold.

The patient is usually first attacked with wandering, sharp, piercing pains of the limbs, occurring in paroxysms ("lightning pains"), often with double vision and extreme or unequal contraction of the pupils. The pupil does not contract when exposed to light, but acts when the patient looks at a distant object (Argyll-Robertson's test). In other instances optic atrophy precedes or accompanies the early stage of the malady. The paroxysms of pain increase in frequency and severity, usually affecting the lower limbs, but occasionally the arms and neck; in rarer instances the rectum or urethra is the chief seat of the suffering. The sensibility of the skin is generally greatly lessened, or altogether lost, and in some instances a prick on the skin is not immediately felt, the sensation of pain being much more slowly conducted than in the normal state.

The cutaneous reflexes are lessened or abolished. Occasionally ulcers form on the sole of the foot. These symptoms are attended with partial or complete loss of the knee-jerks on one or both sides. Such a condition may remain for months or years without further increase, and the patient may be able to pursue his usual occupations. If the case proceeds, the inco-ordination of the muscles of the legs becomes more marked, the patient's gait more awkward, and he is apt to fall or stagger when he attempts to walk. The muscles, however, when he is at rest contract with their normal force. In some cases slowness or difficulty in passing urine attracts attention at an early period of the disease.

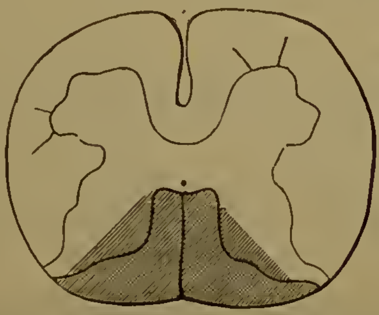
640. The internal organs may be implicated, and the patient suffer from attacks of urgent vomiting; or severe constipation of the bowels; or laryngeal spasm, accompanied by cough and dyspnœa, may present itself. Occasionally effusion into a joint takes place, followed by erosion of the cartilages, and wasting of the heads of the bones (*Charcot's disease*).

641. You distinguish locomotor ataxia from paraplegia by the characteristic pains of the limbs and the affections of the sight that generally accompany or precede the former, by the function of the bladder not being so much

affected in it, and by the muscular power of the limbs being intact when the body is in the sitting or recumbent position.

642. *Diphtheritic paralysis*, when it affects the lower limbs, may be mistaken for locomotor ataxia, as the loss of power is also attended with absence of the knee-jerks, alteration in sensation, and often with loss of accommodation in the eyes. It may be distinguished from locomotor ataxia by the history of sore throat, followed by paralysis affecting various parts in succession, by the loss of power being incomplete, by its onset being more rapid and not being preceded by the severe pains that so constantly accompany the latter disease. The paralysis that follows diphtheria arises from degeneration of the nerve fibres, and is not connected with an anatomical alteration in the spinal cord. There is a loss of faradic excitability in the affected muscles, although they respond to the voltaic current.

FIG. 109.



Loss of muscular co-ordination.

No paralysis of muscles.

Loss of reflex action of tendons.

Bladder and rectum unaffected.

Early stage preceded by neuralgic pains of affected limbs, often by contracted or unequal pupils.

Diagram of a section of the spinal cord in locomotor ataxia. (ERB.)

643. In what is termed "*ataxic paraplegia*" there is a combination of the symptoms of paraplegia and locomotor ataxia. The onset of the disease is slow and the symptoms are gradually developed. The patient is unsteady on standing, reels on turning, and is unable to steady himself, as in locomotor ataxia. But there are no lightning pains, girdle pain is rare, there is no loss of sensation in the feet, the knee-jerks are increased, and there is often ankle

clonus. The iris acts when the eye is exposed to light; there is no nystagmus, but the articulation is often impaired. In the cases that have been examined after death sclerosis has been found in the posterior and also in the lateral columns.

644. *Hereditary ataxy* (*Friedreich's disease*) is also an affection of the posterior and lateral columns. It affects different members of the same family, and is met with at an earlier age than locomotor ataxia. Although the lightning pains are absent, the patient presents the symptoms of impairment of co-ordination, and the knee-jerks are absent. As the disease progresses, there are movements of the head and neck, speech is impaired, and nystagmus presents itself.

645. *d.* Weakness of some muscle or group of muscles gradually takes place (usually the ball of the thumb or the deltoid is first affected), followed by their wasting and gradual disappearance; the sensibility of the parts is not impaired; vibrations of the affected muscles are often observed.

The disease is *progressive muscular atrophy.*

The complaint is most frequent in males between the ages of twenty-five and forty-five, and is hereditary in a large proportion of cases, it has occasionally followed injuries to the spine, in other instances it has been attributed to syphilis, exposure to cold and wet, and long continued anxiety and distress. It is not infrequently preceded by pains resembling rheumatism in the muscles that afterwards become affected. The bulk of the muscle gradually lessens, and the power of motion diminishes in proportion to the wasting. There is a diminution in the faradic contractility of the affected parts, and the loss of power does not precede, but follows the atrophy of the muscular fibres. The muscular reflexes disappear in the parts affected.

Slight irregular twitchings of the fibres of the affected muscle are often to be observed and may take place spontaneously every few minutes; they are unattended by pain, and may be induced by a slight tap over the part. The muscles of the thumb and the interossei are usually first attacked by atrophy, so that the shape as well as the power of movement of the hand is greatly altered. The deltoid and the upper part of the arm suffer next, followed by atrophy of the scapular muscles and those of the back. If the diaphragm and intercostals are implicated the respiration becomes gradually embarrassed.

The course of the disease is generally very chronic (nine months to five or six years), and death generally occurs from the muscles of respiration becoming implicated. Changes are discovered with the microscope after death in the anterior cornua of the cord, in the anterior roots and trunks of the nerves, and in the muscles which exhibit various stages of degeneration.

646. In "*pseudo-hypertrophic muscular paralysis*" there is apparently an increased development of the affected muscles along with a loss of power. It chiefly manifests itself at the close of infancy, and is rare after ten years of age. It is most common in the male sex. It often occurs in several members of the same family, but does not appear to be hereditary. Impairment of power usually precedes any increase in the bulk of the muscle, those of the calf of the leg and the infra-spinati being most apt to be attacked. The patient is unable to walk upstairs, to rise from the floor, or execute any of the movements in which the affected structures are brought into action. One muscle after another is gradually implicated, and the patient loses the power of motion. If the muscles of the chest become diseased serious difficulty is experienced in respiration. The bladder and rectum are not liable to be affected. The enlarged muscles eventually waste. Death is usually due to some affection of the chest arising from interference with the respiration.

The disease consists in the accumulation of fat between the muscular fibres with atrophy of the contractile tissue.

647. In *glosso-labio-laryngeal* (*bulbar*) *paralysis* the earliest

symptom is usually difficulty in speaking, arising from stiffness of the tongue, but in other cases the voice first becomes weak and altered in its tone. The loss of power of motion and sensation increases, until the lips, tongue, soft palate, pharynx, and larynx are all affected. Swallowing is difficult, saliva dribbles from the mouth, and the tongue cannot be protruded. Semi-solids are more readily swallowed than liquids. The intellect is not impaired; towards the termination of the case there may be rapid and irregular action of the heart and attacks of dyspnœa. It usually occurs between the ages of fifty and seventy, and not infrequently accompanies *progressive muscular atrophy.*

B. The loss of power is accompanied by a trembling of the affected parts.

648. Under this head you meet with paralysis agitans, multiple sclerosis, and lateral sclerosis.

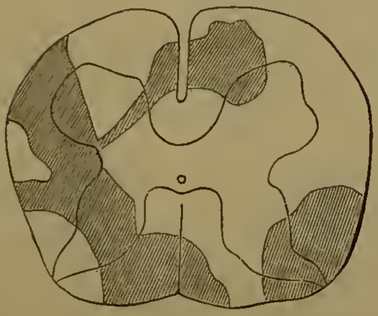
649. *a.* The parts affected are continually shaking independently of voluntary movements and the muscular power is feeble; at first the muscles can be steadied by an effort of the will, but afterwards their motions are beyond control.

The disease is *shaking palsy* (*paralysis agitans*).

The complaint is most frequently met with in the male, and rarely begins before fifty or after sixty-five years of age. The tremor and loss of power are sometimes preceded by rheumatic pains in the affected parts. It not infrequently follows violent mental emotion or distress of mind. The speech is slow, but not difficult. The hands are generally first attacked, and the power of writing is lost; voluntary movements are performed slowly and feebly, but the paralysis is never complete; the muscles are generally rigid. The expression of the face is dull, but there is rarely shaking of the head. In many cases there is a tendency to stoop forwards, and the patients are obliged to run when they attempt to walk. The intellect is unimpaired, and the power over the bladder and rectum is unaffected. The tactile and muscular reflexes are normal.

650. *b.* The affected limbs are feeble and tremble whenever a muscular effort is made, but the tremor is absent when they are at rest and during sleep. After a time the trembling disappears, and the limbs become completely paralysed, often contracted. The speech is slow and hesitating, each word being uttered in syllables, the lips tremble, the eyeballs oscillate (nystagmus), giddiness is complained of, and the mental powers are impaired. There is a liability to attacks of apoplexy attended with elevation of temperature.

FIG. 110.



Trembling of muscles on exertion.

Partial loss of power followed by paralysis.

Bladder and rectum unaffected.

"Scanning" speech.

Trembling of the lips.

Oscillation of the eyeballs.

Diminution of intellectual power.

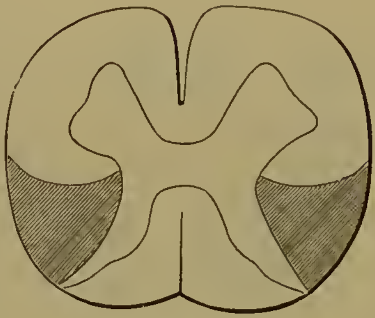
Diagram of a section of the spinal cord in multiple sclerosis. (ERB.)

The disease is *disseminated sclerosis.*

The disease usually presents itself in persons below forty years of age, and is most general between twenty and thirty. The lower extremities are usually first attacked, and the loss of muscular power is the most striking manifestation of the disease. The tremor is best seen in the hands, and the patient may be observed to spill the liquid as he attempts to raise a glass of water to his lips, but the trembling ceases as soon as he desists from muscular effort. The muscles of the neck are frequently affected, and irregular movements of the head and trunk take place as soon as he attempts to sit up. The knee-jerks are usually exaggerated, and ankle clonus is not infrequently present. There is rarely any loss of movement of the iris, but optic atrophy sometimes presents itself. The symptoms, however, vary in different cases according to the parts of the nervous centres which are the seats of the patches of sclerosis. In some the cord is almost (fig. 110) entirely affected, in others loss of intellectual power forms the prominent symptom.

651. You distinguish multiple sclerosis from paralysis agitans, with which it was formerly confounded, by the trembling in the former taking place only during muscular efforts, whilst in paralysis agitans it occurs even when the limbs are at rest. In multiple sclerosis there is loss of power before the tremor is apparent, in paralysis agitans the paresis follows after the trembling has lasted for some time. Multiple sclerosis usually attacks persons below forty; it is accompanied by nystagmus, a slow, hesitating, "scanning" pronunciation, giddiness, impairment of the intellect, and by a liability to attacks of apoplexy. Paralysis agitans is a disease of old age: there is no nystagmus, the articulation is not altered, and the mental powers are unaffected.

FIG. 111.



Paralysis of affected limbs.

Rigidity and contraction of muscles.

Spasms and trembling on exertion.

Increase of reflex of tendons.

Often follows diseases of the brain and spinal cord.

Diagram of a section of the spinal cord in lateral sclerosis. (ERB.)

652. *Lateral sclerosis* usually occurs as a consequence of disease of the brain or spinal cord, but it occasionally comes on without apparent cause. The weakness of the

legs begins very gradually and is attended with increased knee-jerks and ankle clonus. The affected muscles lose their power, and become rigid and contracted, every effort being accompanied by spasmodic twitchings or tremors. The arms usually escape, but when they are implicated they present a condition similar to that of the lower extremities. The sphincters are rarely affected. There is generally an absence of pain, but there may be a sense of tingling or numbness in the parts affected. When, as is often the case, the disease implicates the anterior cornua, rapid wasting of the muscular structures ensues (fig. 111).

653. Men working in lead are liable to palsy of the extensor muscles of the forearm, but the peculiar dropping of the wrist, the discovery of a blue line round the gums, the previous existence of colic, and the nature of the occupation will in such cases direct your diagnosis aright.

654. *Mercurial tremor* is a form of trembling palsy that affects persons whose occupations oblige them to use mercury. *Writer's cramp* is a painful cramp affecting the hands and fingers of clerks whenever an attempt is made to use a pen. It probably arises from over-action of the muscles.

CHAPTER XIV

FEVERS

655. ALMOST every inflammation is attended with the symptoms of fever—viz., quick pulse, thirst, increased heat of skin, loss of appetite, scanty high-coloured urine, confined bowels, and general restlessness or great weakness. In case, therefore, you meet with these symptoms, you must first examine the condition of all the principal organs, so as to find if there is any local cause sufficient to account for them. Remember that in children slight disorders, such as teething or indigestion, may give rise to sharp febrile symptoms. You should not conclude, however, because you find some organ affected, that it has necessarily produced the fever, for every fever is liable to give rise to local inflammations. To arrive at a correct diagnosis you must carefully inquire into the history of each case and discover whether the symptoms of the local disorder, or those of the fever, were first developed.

656. Late researches seem to throw considerable light upon the nature of febrile diseases. It has been shown that certain vegetable organisms, named bacteria, which are so minute as to require the higher powers of the microscope for their detection, are often present in the blood and tissues of those affected with these disorders. When some of these bacteria are removed from the body they can be grown on various substances, such as jelly and animal broths, and by inoculating certain animals with minute quantities of the organisms thus cultivated the original

malady is reproduced in them. In this way tubercle, erysipelas, pyæmia, &c., have been communicated from man to some of the lower animals, and the causation of these diseases by bacteria has been demonstrated. In others, although micro-organisms have been discovered in the system during life, all attempts to reproduce the diseases in animals have failed, so that their dependence upon such a cause is still doubtful.

657. The infectious fevers are capable of being communicated from one person to another, the micro-organisms to which the symptoms are due being introduced through the lungs, digestive tract, or the skin. For a time after their reception there is a period (incubation) during which there are no indications of any ill effects having been produced. The length of this varies in different fevers, but is tolerably constant in each separate disease. At the end of this period certain characteristic symptoms present themselves. The symptoms exhibited by the patient are supposed to result from some poisonous material produced by the action of the micro-organisms on the blood or tissues. In each fever the symptoms manifest a tendency to run a definite course and to terminate within a certain period.

658. In the investigation of fevers you will require all the means of physical diagnosis you have already learnt to employ in the diseases of each organ. In addition, the thermometer is necessary to enable you to obtain correctly the temperature of the patient. A little care is required in its use. Introduce the bulb of the instrument below the fold of the skin covering the edge of the pectoralis major muscle, and keep it in close contact with the axilla for five minutes, having previously warmed it by holding it in the hand. Read off the degree of temperature to which the mercury has risen before removing the thermometer, unless it has a self-registering scale attached to it. The observations should be taken twice in the day; from seven to nine in the morning, and from five to seven in the evening, being the most suitable times. The normal temperature of the

axilla is 98·6°, and any notable deviation from this (below 97° or above 99·5°) indicates ill-health.

659. In some cases, as for example when the patient is so thin that it is difficult to keep the thermometer in contact with the axilla, it is more useful to take the temperature in the mouth. The bulb should be placed below the tongue, and the lips closed so as to grasp the stem of the instrument. The temperature in the mouth is usually a little higher than in the axilla. Of course, a thermometer should not be used in the mouth of a patient who is delirious, or in children. In some instances it is important to ascertain the temperature of the interior of the body, and this is best effected by the introduction of the thermometer into the rectum or the vagina. The temperature in these parts is somewhat higher than in the mouth or the axilla.

660. In a healthy person the temperature varies somewhat at different times of the day. It is lowest from 2 A.M. to 6 A.M., it gradually rises until between 5 P.M. and 8 P.M., after which it again slowly diminishes. In febrile diseases there is commonly a similar fluctuation, you may therefore expect to find the temperature of a patient higher in the evening than in the early hours of the day. In some cases there are considerable variations of temperature during the day, so that it is often necessary to have the temperature taken every few hours, instead of confining your observations to the mornings and evenings. In every case mark the temperature each time it is taken upon a chart, so that you may be able to see with greater ease the course the fever has pursued.

661. Various classifications of temperatures have been proposed, but the following is enough for all practical purposes:

Collapse temperature	below 96·8°.
Sub-normal temperatures	96·8° to 97·7°.
Slight febrile temperatures	100·4° to 101°.
Moderate febrile temperatures .	101·3° to 102° in morning; 103° in evening.
High fever . . .	103° in morning; about 105° in evening.
Hyperpyrexia	105·8° to 107·5°.

662. The form of the fever varies in different diseases and at different periods of the same fever. It is said to be *continuous* when it remains about the same point above the normal, falling, as in health, a little in the morning and rising in the evening. It is described as *remittent* when there is a considerable difference between the morning and evening, but the lowest point remains above the normal: it is termed *intermittent* when the morning temperature falls below the normal line, whilst that in the evening is some degrees above it.

663. No conclusion can be drawn from a single observation of temperature in any case, unless it is supported by other symptoms. Febrile diseases exhibit certain stages or periods, which can be recognised by the course of the temperature. The most clearly marked in cases that recover, are the following:—1. The *initial* or *pyrogenetic stage*, which generally begins with a shivering fit, and in which the temperature is high, although the patient may complain of feeling cold. In typhoid fever this stage takes four days to reach the temperature of 104°. 2. The *fastigium* or *acme*, in which the highest average temperature of the disease is attained. 3. *The period of critical perturbation*, or *stage of decrement*, which is followed by the period of *defervescence* or cooling down. This may be sudden, when it is called *crisis;* or slower (occupying perhaps some days), when it is named *lysis.*

664. You may take the following as general rules respecting temperatures: 1. That either very high or very low temperatures must be regarded as dangerous—if excessively so, they are usually fatal. 2. Very sudden changes are suspicious, and often dangerous. 3. A fresh rise, after the temperature has begun to fall, or has been stationary for some time, generally indicates a complication or the approach of some new disease. 4. An unexpected fall usually accompanies hæmorrhage, perforation of the pleura or peritoneum, or exhausting diarrhœa. 5. A considerable rise in a disease, not usually considered febrile (epilepsy,

chorea, tetanus, cancer, &c.), is often a forerunner of death.

665. A patient may have a *normal axillary temperature*, and his pulse and respiration may be normal so far as *number* goes, and yet he may die within an hour or so. It is therefore important to note the characters of the pulse and respiration, and to take the general condition of the patient, as to muscular strength, &c., into consideration. It is now pretty generally admitted that there may be severe and dangerous peritonitis, pleurisy, bronchitis, enteritis, or inflammation of other organs without the *general* temperature (or that in the axilla) being raised above the normal. The temperature may be even subnormal in the axilla in some of these cases.

666. It is sometimes desirable to ascertain, by chemical analysis, the rate at which the destruction of the tissues is going on. You do this by estimating the amount of urea excreted by the kidneys in the twenty-four hours. The following is an easy method:

"1. A glass measuring tube of about a foot in length drawn out to the end, which will be uppermost when the tube is used, like a Mohr's burette, and subdivided into thirty parts of equal capacity, the aggregate volume of which is 55 c.c.

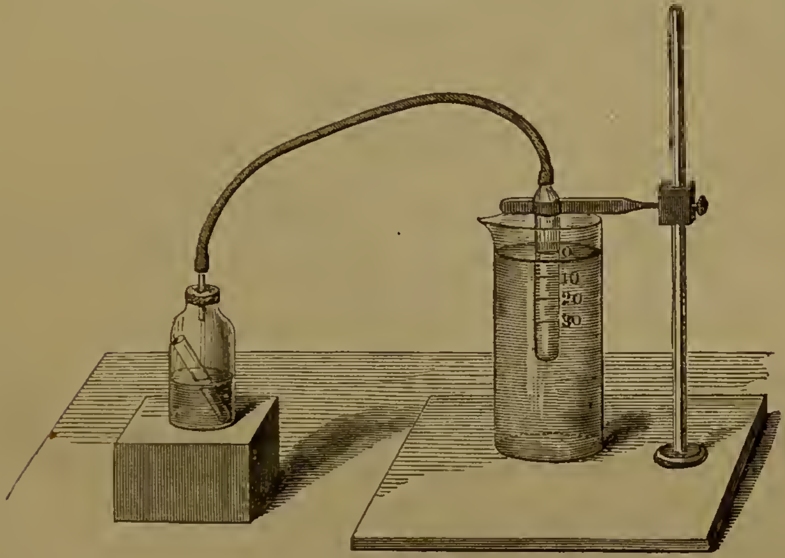
"2. A small wide-mouthed glass-bottle of about 66 c.c. capacity.

"3. A short test tube of about 10 c.c. capacity, and of such height that when introduced into the glass-bottle it will stand within it in a slightly inclined position.

"The following are the arrangements for combining the apparatus and working an experiment:

"The graduated tube, held in a clamp attached to a retort stand, if depressed into a glass cylinder, nearly filled with water until the zero mark, which is near the upper end, exactly coincides with the surface of the water. 15 c.c. of the hypobromite solution (100 grms. of NaHO, 250 c.c. of water, 25 c.c. of bromine) having been poured into the flask, the test tube containing the urine is introduced by means of forceps, care being taken that none of its contents shall spill into the hypobromite. The flask is now closed with a very accurately fitting india-rubber stopper, perforated with a hole, in which is inserted a short piece of glass tubing open at both ends, and is then connected with the measuring tube by means of a piece of elastic tubing. It is now inclined so as to allow the urine to mix with the hypobromite. Effervescence at once commences, and as it proceeds the measuring tube is gradually raised so as to relieve the disengaged nitrogen from the hydrostatic pressure. The flask is shaken a few times, and when the reaction is completely over, the apparatus is left for a few minutes until it has acquired the temperature of the room in which the experiment is performed. Another exact levelling of the measuring tube is made, and the number of the division corresponding to the volume of the developed nitrogen is read off.

FIG. 112.



"If we operate on 5 c.c. of urine, each measure of nitrogen evolved will correspond to 0·1 per cent. of urea. The above rough sketch represents the apparatus just before the flask is inclined, so as to bring the urine and the hypobromite solution into contact" (see fig. 112).*

667. Having ascertained that the febrile symptoms under which the patient labours are not dependent on any local disorder, examine if there is any well-marked eruption on the face, body, or extremities. If such is the case, and the spots have appeared within the first four days of illness, begin at (668). If the eruption has appeared at a much later date, or if, without any rash upon the skin, the symptoms of the fever have been continuous, pass on to (682). If there is no eruption, and the fever recurs at regular periods, subsiding in the intervals, pass on to (696).

SECTION I

The Fever is attended with a well-Marked Eruption on the Skin, which has appeared within the First Four Days of the Illness

668. Under this head you meet with—scarlatina, measles, erysipelas, small-pox, chicken-pox. These fevers are all infectious, and there is a period between the exposure to infection and the onset of the fever, termed *the stage of incubation.* The first appearance of the illness is usually sudden and attended with shivering, which is followed by a train of symptoms peculiar to each disease. This stage is termed the *febrile stage*, and is terminated by the appearance of the eruption (*eruptive stage*), which declines after a certain number of days. As a general rule, a person can only once in his life be attacked by each of these diseases. In the diagnosis of these complaints you must not only observe the eruption, but you should ascertain the nature of the symptoms preceding its appearance, also whether the patient has been exposed to infection, and from what eruptive fevers he has previously suffered.

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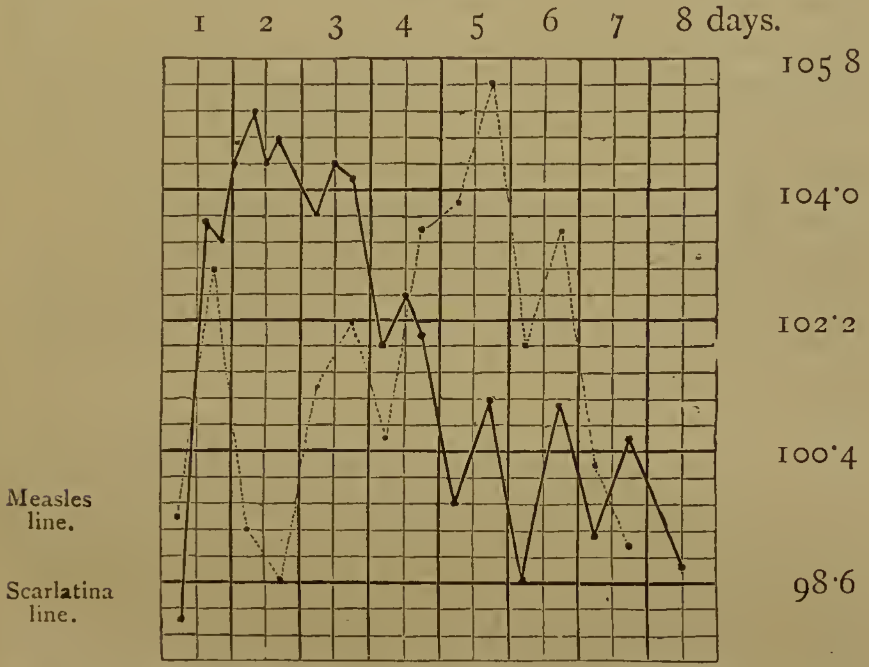
* *Chemical News,* January 22, 1875.

669. *a.* On the fourth day of the illness there has appeared, first on the forehead, face, and neck, but afterwards over the whole body, an eruption of raised red spots, which coalesce, and form slightly elevated blotches of a crescentic shape; the tongue is coated, the fever high. The eruption was preceded and is accompanied by headache, discharge from the nose, redness and swelling of the eyes, cough, and quickness of breathing.

FIG. 113.



The above figure shows the course of the temperature in an attack of measles, and in one of mild scarlatina. (WUNDERLICH.)

The disease is *measles*.

The complaint occurs as an epidemic, and children are most susceptible to it. It is infectious in the febrile stage before the appearance of the eruption, as well as whilst the eruption is present. Micro-organisms have been discovered in the breath and in the skin of those suffering from measles, but their relation to it is still doubtful.

The period of incubation is ten to fourteen days. Chilliness or rigors, and sometimes convulsions, precede the eruption, and occasionally bleeding at the nose is observed. The cough and other chest symptoms are not generally relieved on the appearance of the rash. In most cases the throat is also inflamed, and diarrhœa is apt to come on with the eruption and is often very obstinate. The temperature rises rapidly at first, and then falls again before the eruptive elevation of temperature (fig. 113). The highest temperature in ordinary cases is 103° ; if it rises above this, the case will be probably severe; if much lower, it will be a mild attack; the maximum of temperature is generally on the fifth day, after which it rapidly falls; the rash disappears on the fifth or sixth day after its coming out, and is succeeded by bran-like desquamation of the skin.

Measles may exist without catarrhal symptoms. Laryngitis, diphtheritic inflammation of the larynx, capillary bronchitis, and pneumonia are the chief causes of danger during the attack; but phthisis, diphtheria, diseases of the bones and glands, and chronic ophthalmia occur as sequelæ of the complaint. The papillæ of the skin appear to be first and principally affected, and it is from this circumstance that the eruption presents itself in the form of raised red spots.

670. There are two varieties of measles, the *slight* and the *severe or malignant;* in the latter, the eruption is of a dark purple colour, the pulse is quick and feeble, the tongue brown, the patient is delirious or comatose, and he is apt to sink from exhaustion.

671. *b.* On the second day of the fever there has appeared on the upper part of the chest and neck a diffused scarlet rash, which extends over the whole body in twenty-four or thirty-six hours. The throat is inflamed, the tonsils enlarged and often ulcerated, the glands below the angle of the jaw tender and enlarged, the pulse rapid, the skin hot and dry, the tongue at first coated, with red tip and edges and red elevated papillæ, afterwards clean and raw-looking. The eruption is generally preceded in children by vomiting.

The disease is *scarlatina.*

Infection may be communicated by contact with a person suffering from the disease or by the clothing or other articles that have been used by him. Some epidemics appear to have been spread through the medium of milk. Children who have lately undergone operations, and women after their confinement seem especially liable to be attacked with it.

The period of incubation is from four to six days. The febrile stage is usually ushered in by shivering, vomiting, or diarrhœa; occasionally delirium and convulsions appear. The inflammation of the throat usually presents itself before the eruption appears upon the skin, and the glands at the angles of the jaw and of the neck are enlarged at an early period of the disease. The eruption usually declines on the fourth or fifth day, and is followed by peeling of the skin, especially of that covering the hands and feet. The temperature rarely rises above 105°, but it may nearly reach that height on the first day of the eruption. It at first rises rapidly and continuously until the eruption appears: its fall is very gradual, and occupies five or six days (fig. 113). It is generally at its maximum on the third day of the fever, from the third to the ninth it ranges between 103·8° and 102·9°, and subsides between the tenth and twelfth day, unless the throat be severely affected, when it may be indefinitely prolonged. The pulse falls along with the temperature. The danger in the early period of scarlatina is generally in proportion to the severity of the throat affection, but life may be destroyed by *malignant* scarlatina at the very outset of the disease.

After the cessation of the fever, and usually from the tenth to the twentieth day, the patient is liable to acute nephritis, indicated by bloody or albuminous urine and dropsy of the body and limbs (221), sometimes associated with convulsions or hydrothorax. In other cases scarlatina gives rise to acute rheumatism, to discharge from the ear and consequent deafness, or to diphtheria. In some severe cases sloughing may occur in the neck, and a large surface of the skin and the connective tissue below it may be destroyed. Occasionally diphtheria follows an attack of scarlatina. As soon as the rash has disappeared the urine should be tested daily for albumen (211).

In fatal cases the microscope shows the rete mucosum of the skin to be much thickened, and to contain a large number of newly formed nucleated cells. The epithelium of the sweat-glands is often so much increased as to block up their ducts. In other cases both the rete mucosum and the sweat-glands are stained with blood, due to hæmorrhage having occurred into these structures. A similar state of inflammation is present both in the stomach and intestines. The gastric tubes are distended with cells and granular matter (fig. 86), and in many cases membranous "casts" of the tubes are found in the contents of the stomach. The tubes of Lieberkühn are also choked with epithelium, and the mesenteric glands are generally enlarged.

Micrococci have been found in the blood, on the scales of the epidermis, and in the secretions of the throat of those affected with scarlatina, but they have not as yet been proved to be the cause of the complaint.

672. There are three varieties of the disease—*simple*, *anginose*, and *malignant*. In *simple* scarlatina the throat is inflamed but not ulcerated, and the fever is moderate. In the *anginose* variety the throat is ulcerated, the temperature high, the pulse rapid, and the prostration of strength great. In the *malignant* form the eruption is faint or scarcely visible, the pulse is feeble, rapid, and irregular, the tongue brown, the throat is apt to slough, and the glands of the neck are enlarged and suppurate; there is consequently great danger to life.

673. Scarlatina may be confounded with roseola, measles, or small-pox. The eruption of roseola consists of irregular, rose-coloured blotches confined to the chest, the throat is little affected, and the accompanying fever is slight. Scarla-

tina is known from measles in the early stage by the absence of the affection of the eyes, nose, and bronchial tubes, and by the fever which is continuous, whilst in measles it is usually remittent before the appearance of the rash. Afterwards, the affection of the throat in scarlatina, the appearance of the eruption, the absence of bronchitis, the desquamation of the skin, and the frequent occurrence of albumen in the urine, will enable you to distinguish between them. Small-pox is sometimes ushered in with an eruption like scarlatina; but the previous pain of the back and the subsequent papular form of the eruption serve to distinguish it.

674. *c.* After a few hours of indisposition, an eruption of red-coloured spots has appeared on the face and extended next day to the body and limbs. The eruption is not followed by desquamation. There is slight accompanying fever.

The disease is *Rubella.* (*German measles.*)

The disease was formerly supposed to be a hybrid between measles and scarlatina, it is now generally allowed to be distinct from both. An attack does not render the patient incapable of being afterwards affected by either of these complaints. It is very infectious, and the period of incubation is supposed to vary from ten to fourteen days.

In some instances there is a feeling of illness for a few hours before the appearance of the rash, in others the eruption is the first indication that the patient is not in his usual state of health. Soreness of the throat sometimes precedes the eruption, and the lymphatic glands of the neck are almost always enlarged and painful, and may remain in that state for some time after the eruption has disappeared. Fever may be absent, or if present, it is slight. Complications rarely present themselves.

675. It is distinguished from measles by the absence, or trivial character of the premonitory fever, discharge from the nose, cough, or indications of bronchitis, whilst it is accompanied by enlarged cervical glands, which are less often present in measles. During the eruption there is but

slight constitutional disturbance, and the patient does not suffer from bronchitis or pneumonia.

76. From scarlatina it differs in the absence of high fever and severe affection of the throat. The eruption does not present the same diffused redness, and the fever, if present, does not persist during the eruption. The disease is not, like scarlatina, followed by desquamation of the skin, nor by nephritis, acute rheumatism, or the other sequelæ of that disorder.

TABLE OF SYMPTOMS OF THE FOLLOWING DISEASES.

	SCARLATINA.	MEASLES.	RUBELLA.
Appearance of eruption	Second day	Fourth day	May be earliest symptom, or in one or two days
First shows itself	Neck and chest	Near roots of hair	Face and trunk
Appearance of eruption	Uniform scarlet erythema	Slightly elevated, crescentic patches	Round or oval, slightly raised spots
Subsequent changes of skin	Copious desquamation	Slight branny desquamation	Slight superficial desquamation
Symptoms preceding or accompanying the eruption	Sore-throat ; often vomiting	Coryza ; cough ; bronchitis	May be slight sore-throat or cough
Fever	Usually high	Moderate ; may be high	Slight or absent
Sequelæ	Acute nephritis ; rheumatism ; otitis	Bronchitis ; broncho-pneumonia	Often enlarged glands of neck

677. *d.* The patient has been attacked with redness, heat, and swelling of some part of the body, attended with the

formation of vesicles; the inflammation commences at one part and gradually spreads. There are great pain and stiffness of the parts affected, and the neighbouring lymphatic glands are swollen. The accompanying fever is usually high.

The disease is *erysipelas*.

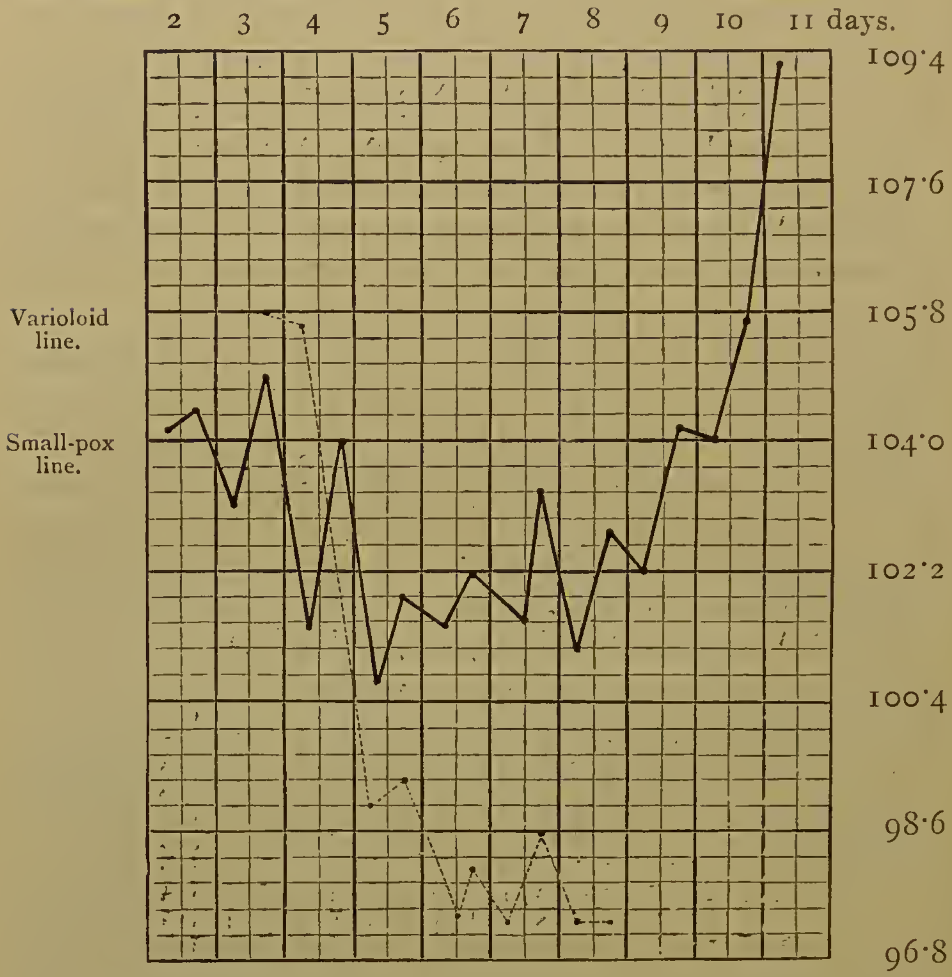
The disease is contagious, and is especially apt to follow wounds or other injuries. The usual site for erysipelas, in medical practice, is the head and face. It is preceded for a few hours or days by a certain amount of fever, and generally commences with a slight swelling over the bridge of the nose, or near one of the ears, from which it spreads until the whole face and scalp are affected, the eyelids become œdematous and the features swollen and disfigured. The temperature in the axilla is high, often reaching 103° or 105°, but it varies greatly during the course of the disorder. The pulse is rapid. Delirium is common when the disease is at its height; in some cases it is of a low type and is followed by coma. The urine often contains albumen. In some instances the throat is attacked and œdema of the glottis takes place. Micrococci have been detected in the lymph spaces of the skin at the advancing margin of the eruption. They seem to be capable of producing the disease in man and some of the lower animals when these have been inoculated with cultivations of the micro-organism. In many cases suppuration of the subcutaneous cellular tissue occurs, and abscesses form as the inflammation subsides.

678. *e.* On the third or fourth day of illness, an eruption of a papular form has appeared on the face, neck, and wrists; on the second or third day of the appearance of the spots they have become vesicular, and afterwards pustular. The eruption is preceded by severe pain of the back, rigors, vomiting, constipation, headache, restlessness, fever, and sometimes delirium.

The disease is *small-pox*.

Small-pox is propagated by contagion, either directly from the patient, or from clothes or other materials that have been in contact with him. The period of incubation is from ten to sixteen days. During this time the person may be in his usual health, or he may complain of loss of appetite, constipation, general weakness, and disinclination for exertion. The invasion is ushered in by chills or rigors, attended with severe pains in the back and head, often nausea or vomiting, a general feeling of illness, the temperature rising to 104°, 105° or even higher. The patient is

FIG. 114.

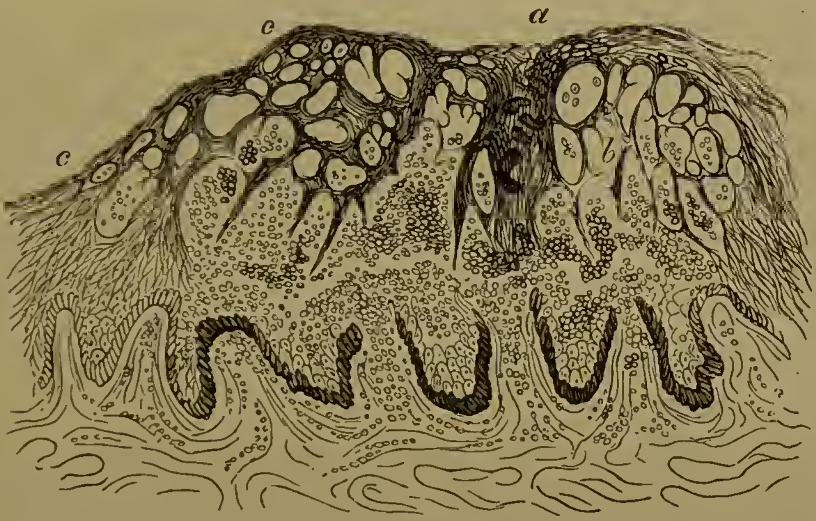


Shows the course of the temperatures in a case of small-pox which terminated fatally in the suppurating stage, and in a case of modified small-pox (*varioloid*). (WUNDERLICH.)

usually relieved and the pulse and temperature decrease, or fall to the normal, as soon as the eruption appears.

The spots become pustular about the fifth or sixth day after their appearance; on the eighth day matter begins to ooze from their edges, and a decided increase of fever sets in (*secondary fever*). It is especially marked by a fresh rise of temperature about the eleventh and twelfth days of the fever (the suppurative stage), when the danger to life is the greatest (fig. 114). Scabs are formed and fall off on the fourteenth or fifteenth day, leaving pits in their places.

FIG. 115.



Shows a section through the middle of a pock passing from the granular to the pustular stage. *a.* Umbilicus with duct of sweat-gland. *b.* Cavities in the substance of the rete mucosum filled with lymph. *c.* Small cavities containing pus cells. (RINDFLEISCH.)

679. Small-pox is termed *discrete* when the spots are few and separate; *confluent* when they run together; the danger is in proportion to the amount of the eruption. When the disease is *modified* by vaccination (*varioloid*), although the primary fever may be very severe, the spots form scabs and die away about the eighth day without any secondary fever. Albumen is often present in the urine. Occasionally,

the typical eruption is preceded by an erythematous rash that disappears as the papules present themselves and which may closely resemble measles or scarlatina (673). In other cases, there is a hæmorrhagic rash which is stated most commonly to present itself on the lower part of the abdomen or the groins.

Small-pox may be complicated, especially during the secondary fever, with pneumonia or bronchitis; or it may be followed by erysipelas, abscesses in various parts of the body, ulceration of the cornea or pyæmia.

The microscope shows that in the earliest stage there is inflammation of the papillæ of the skin. An exudation takes place from the papillæ into the rete mucosum, which separates the layers of the latter from each other (fig. 115). When suppuration occurs, if the rete mucosum is alone destroyed no scar is left. But when the papillæ become so infiltrated by newly formed cells that their blood-vessels are compressed, sloughing takes place, the dead portions are thrown off, and, when the part heals, a scar is the consequence.

680. Small-pox is chiefly distinguished from other eruptive fevers in the primary stage by the severe pain of the back and the vomiting that accompany it. In the early period of the eruption, the fact that the spots feel to the finger as if small shots were embedded in the skin is very valuable in distinguishing this complaint from measles and scarlatina. In the worst form of small-pox the eruption is sometimes preceded by a livid redness of the skin, more or less diffused; delirium and typhoid symptoms, or hæmorrhage from the mucous membranes, may speedily follow.

681. *f.* On the second day of a mild fever there has appeared an eruption, which is at first papular, but in a few hours becomes vesicular. The spots have no inflammatory ring around them in the first stage.

The disease is *chicken-pox* (*varicella*).

This disease is peculiar to childhood and early adult age; its period of incubation varies from ten to sixteen days.

The eruption consists of a series of crops that succeed each other for four or six days, at intervals of twenty-four hours. Each spot forms a scab, about the fourth day of the fever, which falls off and seldom leaves any pit. Chicken-pox is distinguished from small-pox by the mildness of the premonitory symptoms, the distinctly vesicular character of the spots, the absence of hardness to the finger, and by the shorter course of the complaint.

SECTION II

No Eruption has appeared in the Early Stage of the Fever, and, if present, it is usually small in amount; the Febrile Symptoms have been continuous from their Commencement

682. Under this head you may have—typhus, typhoid, relapsing fever, cerebro-spinal fever (570), influenza, mumps, rheumatic fever (699) and pyæmia.

683. *a.* The patient lies on his back in a state of half-consciousness, or low muttering delirium; the eyes are injected, the cheeks are uniformly flushed and of a dusky colour, the lips are covered with sordes, the tongue dry and brown. There are thirst and absence of appetite, but the bowels are not usually purged. The pulse is rapid and feeble, skin hot, respiration increased in frequency. An eruption generally appears on the body and limbs from the fifth to the seventh day, the spots of which are dark-coloured and persistent; they are at first slightly elevated, but after a few days become flat, and do not disappear, although they are made paler by pressure.

The disease is *typhus.*

The disease occurs in an epidemic form. It is very infectious, especially during the second week. It chiefly attacks persons who are crowded together, as in camps or prisons, or those who have been subjected to hardship and privation. The period of incubation is from five to eleven days. An attack of typhus is generally sudden, and begins with chilliness, lassitude, noises in the ears, giddiness, pains of the head and limbs, quick pulse, and hot skin. In other cases it is preceded for a few days by feebleness, headache, and want of appetite. The loss of muscular power is early and marked. The tongue is at first large and pale, afterwards covered with a yellow-brown fur. The eruption generally presents itself on the fourth or fifth day of the fever upon the trunk and spreads to the limbs, but rarely affects the face or the backs of the hands. At its commencement it has a close resemblance to the rash of measles. In two or three days the eruption is complete when it assumes a darker hue and is generally deeper on the back, which part should be always carefully examined in a doubtful case.

There is usually a sudden rise of temperature at the onset, and there is less difference between the morning and evening temperature than in typhoid fever, although it is highest in the evening. In mild cases the temperature attained on the third or fourth day remains without increase until the end of the first week, and after the seventh or eighth day there is a decided remission. In severe cases the temperature increases after the fourth day, and there is no remission on the seventh day. The fever increases in the beginning of the second week ; in mild cases the increase lasts only a few days, but in severe ones it continues until the end of the second week. The critical stage is at the latter end of the second week, or in severe cases at the beginning of the third week. The turning-point is most generally about the fourteenth day, and the decline of the fever is, in cases of recovery, often very sudden, forming what is termed a crisis (fig. 116). If the temperature does not exceed 103·5° before the fourth day, the case will probably be a mild one. Delirium usually presents itself from the fourth to the eighth day. As the disease advances, the stupor increases, the pupils are contracted, the muscles twitch, the hands tremble or catch at the bedclothes, the pulse is so rapid and feeble as scarcely to be felt, and the dulness in the region of the spleen is much increased in extent. The urine and fæces are often passed involuntarily, or the bladder becomes distended from loss of its power of contraction, and bed-sores form on the hips and nates. In severe cases the impulse and the first sound of the heart are very feeble, or may be indistinguishable, the second sound being clear and distinct. Typhus is not infrequently complicated with pneumonia, sometimes with convulsions. The rash is often absent in children and in young persons. The urine is frequently albuminous; a peculiar odour can be often detected in cases of typhus. No form of micro-organism has been identified as giving rise to the disease.

684. You may confound typhus with typhoid fever, pneumonia, meningitis and measles. You can only distinguish typhus when complicated by pneumonia from pneumonia attended with typhoid symptoms, by ascertaining which disease was first developed, and whether or not the characteristic eruption is present. In many cases delirium is a prominent symptom: it seldom sets in until the end of the first week, it is low and muttering, and accompanied by great restlessness. This symptom is apt to make the diagnosis between typhus and meningitis difficult, but the former differs from the latter in the appearance of the tongue, the presence of an eruption, and the feebleness of the pulse; meningitis is accompanied by vomiting, and the headache is more severe and constant than in typhus. It must be remembered that meningitis may occur as a complication of typhus. The early appearance of the eruption may give rise to a suspicion of measles. The rash of measles, however, first appears on the face, that of typhus on the trunk, the face being rarely affected. Measles is preceded and accompanied by catarrh of the conjunctivæ, nose and throat, which is not present in typhus, whilst in the latter there is from the first greater feebleness and depression.

685. *b*. The patient suffers from great feebleness, his mind is dull or wandering, the cheeks have a bright circumscribed flush, the tongue is coated, red, fissured, or dry. There are headache, thirst, loss of appetite, and purging of the bowels, the stools being of a yellow colour. The pulse is quick and feeble, the skin hot, and there is swelling of the abdomen, with tenderness and gurgling on pressure over the right iliac fossa, and increased dulness in the region of the spleen. An eruption appears about, or after, the seventh day, of a few rose-coloured, lenticular spots, which disappear for a moment on pressure. The eruption is chiefly confined to the chest and abdomen, and each spot disappears in a few days, to be succeeded by others near it.

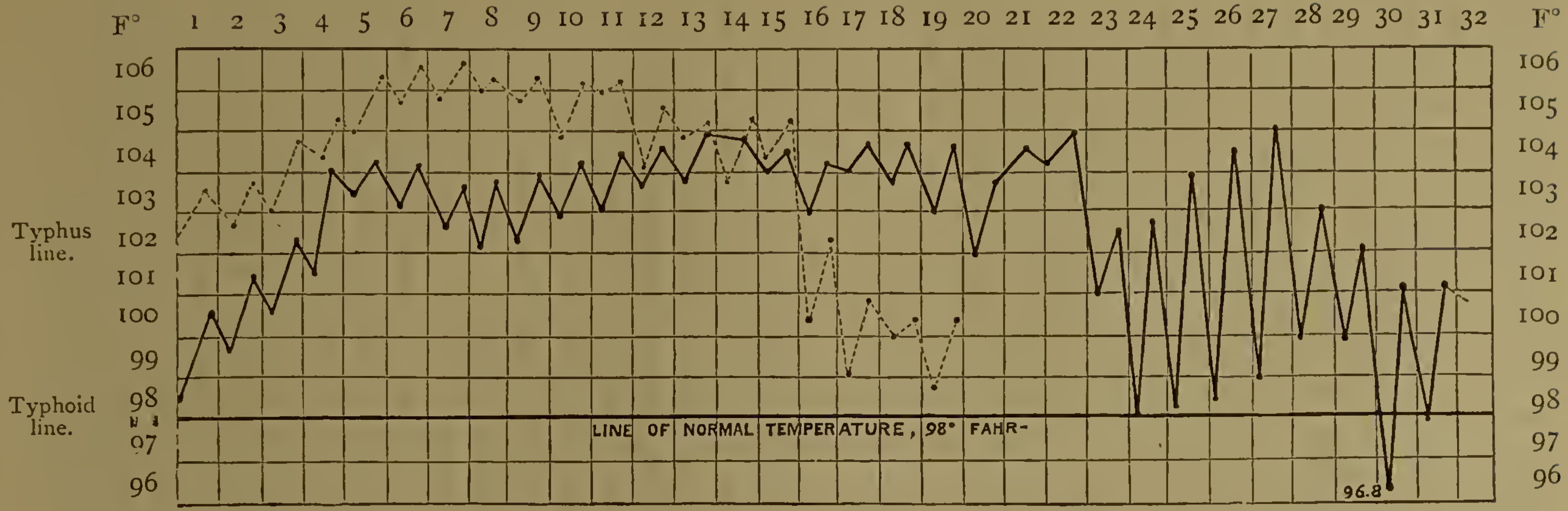
The disease is *enteric* or *typhoid fever*.

The disease is propagated by the excretions of the affected person, water and milk being the usual vehicles for its introduction. It is most commonly met with in persons between the ages of ten and twenty-five, and rarely occurs in those above forty-five. The approach of typhoid fever is insidious, and the first symptoms are those of dyspepsia, sleeplessness, languor, dull pain of the head, often succeeded by slight delirium at nights, loss of appetite, thirst, and diarrhœa. Epistaxis is not uncommon, and may recur from day to day. In rare cases the attack comes on suddenly.

The eruption appears on the abdomen and chest between the fourth and seventh day in the shape of separate, rose-coloured spots that disappear when pressure is made on them, but soon reappear when the finger is removed. Each spot remains about four days, and is followed by others of a similar character. The tongue is foul, red at the tip and edges, there is an absence of appetite, the amount of diarrhœa varies in different cases, but is sometimes replaced by constipation. The urine contains an excess of urea, with a diminution of the chlorides, a small amount of albumen is often present.

The temperature rises very gradually during the first week, that in the evening is often 2° higher than that in

FIG. 116.



Typical ranges of temperature in cases of typhus and typhoid fever. The dotted line indicates the typhus range; the continuous dark line that of typhoid; the two dots under each day indicate the morning and evening temperatures. (WUNDERLICH AND TRAUBE.)

the morning, whilst the next morning it is 1° less than the preceding evening. At the end of the first week there is no increase of evening temperature, but that of the morning is less than in the evening. In the second week there is only a slight morning remission. In the beginning of the third week there is often an increase of temperature, and, if improvement takes place, the difference between the morning and evening is very striking (fig. 116). In case of recovery the fall in temperature is gradual. Mild cases generally terminate in twenty-one days, but severe ones may last four or five, or even eight or ten weeks. A *permanent* temperature of 104°, or an elevation of the morning over the evening temperature, is an unfavourable sign. Relapses may occur at any time within ten days after the cessation of the fever. The temperature then rises, the pulse is quickened, diarrhœa recommences, and all the symptoms of the fever are reproduced. In some instances two or three relapses take place and this is especially apt to occur when the patient has previously suffered from malarial fever.

A fatal issue may occur, whilst the patient seems to be recovering, from perforation of the intestine or hæmorrhage from the bowels, the latter accident being most common in the third and fourth weeks. Recovery is generally slow, and the mind often remains feeble for some weeks. Typhoid fever is often complicated with pneumonia, and it may be followed by phthisis.

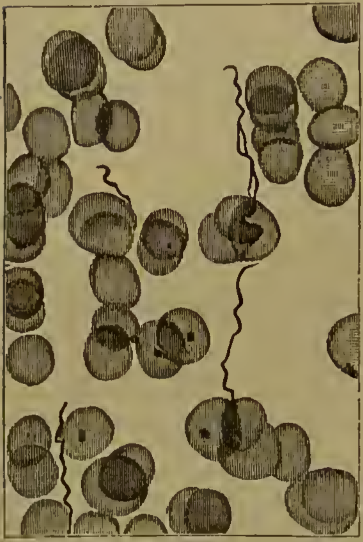
In fatal cases, disease is always present in the lower part of the ileum. The mucous membrane is inflamed, and the solitary glands and Peyer's patches are either enlarged, prominent, and surrounded by inflammation, or they are in a state of ulceration; the mesenteric glands are also softened and enlarged. The perforation of the intestine, which cuts off so many cases of typhoid fever, is the result of these ulcerations. Microscopically, in the earliest stage the whole of the mucous membrane of the affected part is in a state of catarrhal inflammation, the lymphatic follicles are enlarged by an increase in the number of their cells, whilst the blood-vessels around them are greatly congested. The surrounding connective tissue is next infiltrated with cells, and unites with the enlarged follicles to form a soft medullary mass. The follicles may either return to their normal state, by the degeneration and subsequent absorption of their cells, or they may burst and discharge their contents. Usually sloughing of the affected structures occurs, the dead parts are thrown off, and the ulcers before described are left. The cells are said by some to differ from the ordinary lymph-corpuscles, by containing a much larger mass of protoplasmic material. Bacilli have been found in the intestines, mesenteric glands, spleen and liver. They are short, thick, with rather rounded ends, and are capable of being stained with aniline dyes.

686. You will most easily confound enteric fever with meningitis (563), tubercular peritonitis, acute tuberculosis, and typhus. You distinguish it from meningitis by the absence, or less urgency, of the vomiting, the less severe pain of the head, the feebleness of the pulse, the dryness of the tongue, the diarrhœa and the eruption. Although in both typhoid fever and tubercular peritonitis you may have a hectic flush, pinched features, pain of the abdomen, and diarrhœa, yet in peritonitis the tongue is usually clean, and there is no eruption. Acute phthisis is distinguished from typhoid fever by the cough and difficulty of breathing, which appear earlier, and are more intense in the former, by the lower temperature, and the presence of the stethoscopic signs of tubercle, when these exist; also by the absence of the typhoid eruption and enlargement of the spleen. Typhus differs from typhoid fever in affecting persons of more advanced age, the attack is more sudden, the prostration more marked, the duration shorter, delirium or stupor appears sooner, the face is dusky and generally flushed, the bowels are usually constipated, and the rash is darker, more general, and not, after the first day or two, obliterated by pressure, nor does it appear in successive

crops. Typhoid fever in children is often described as *infantile remittent fever.*

687. *c.* The patient has been suddenly attacked with rigors, headache and pain of the back or limbs; the tongue is white, there are thirst, often vomiting, and confined bowels; the pulse is very rapid, the skin hot and dry (104° to 106°), with occasional sweatings; there is no eruption, but jaundice is often present, The symptoms disappear, after a violent sweating, from the fifth to the eighth day, but reappear, as at first, about the fourteenth day of the illness. The relapse usually terminates in from three to eight days, but may be succeeded by others.

FIG. 117.



Spirillum Obermeieri. The spirillum is seen amongst the blood cells. (KOCH.)

The disease is *relapsing fever.*

This disease seldom appears except as an epidemic, and is chiefly seen amongst the poor and ill-fed part of the population. It is very infectious and those in attendance on the sick are often attacked. Its period of incubation varies from two to sixteen days. The invasion is usually sudden, is attended with rigors or a feeling of chilliness, severe pains in the head, back and limbs. The temperature rapidly rises and continues high until the crisis (fig. 118). During the fever the liver is usually large and the spleen can be felt to project below the ribs. The patient rapidly recovers his strength and appetite after the crisis, but there is a repetition of the former symptoms as soon as the relapse occurs. A form of bacterium named spirillum (fig. 117) has been detected in the blood by means of the microscope. The spirilla seem to disappear shortly before the crisis.

It may be impossible to diagnose it from other fevers previous to the crisis. Convalescence is generally very slow, and is apt to be complicated with severe ophthalmic or rheumatic affections. When jaundice is present the stools are of their natural colour, and may be even abnormally dark. The temperature sometimes falls 10°, or even more, during the crisis.

688. Besides the above forms of fever you meet with what is termed *simple continued fever*. In this there are headache, a frequent full pulse, white and coated tongue, thirst, loss of appetite, hot dry skin, pains of the back and limbs, and inability for mental or bodily exertion; but it is unaccompanied by any eruption, and usually terminates by a severe sweating. Before determining a case to be one of simple continued fever, be careful to examine the condition of every important organ, lest the pyrexia be the result of some hidden inflammation.

FIG. 118.

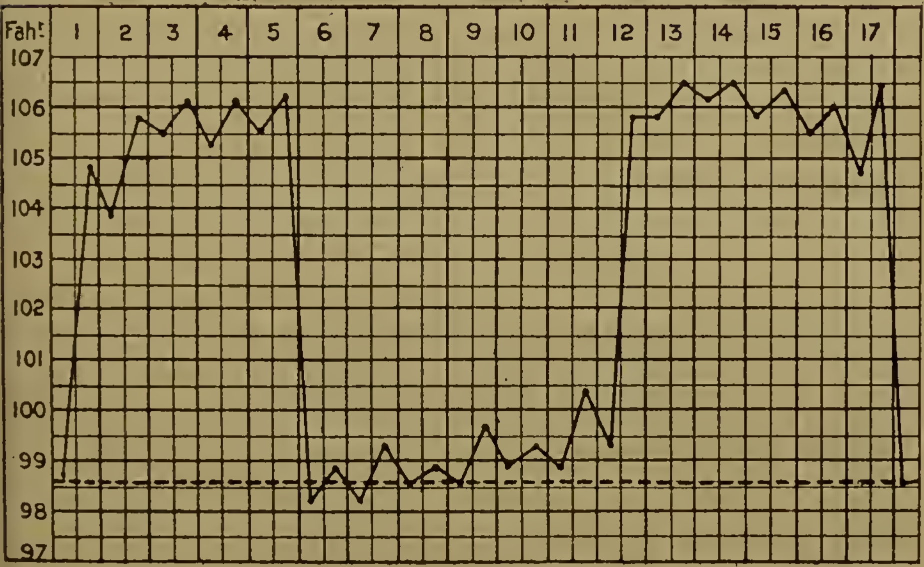


Chart of the temperature in a case of relapsing fever.

689. *d.* The patient is suddenly attacked with chilliness or rigors, great prostration of strength and aching of the limbs,

TABLE OF THE SYMPTOMS IN THE FOLLOWING DISEASES.

—	TYPHUS.	TYPHOID.	RELAPSING FEVER.
Invasion	Sudden	Gradual	Sudden; sometimes rigors
Fever	Rises suddenly, ends by crisis	Rises gradually, terminating by lysis	Rises suddenly; falls about seventh or eighth day by crisis; again relapses about a week later
Eruption appears	On fourth or fifth day	At end of first week	None
Appearance of eruption	"Mulberry rash," first on chest and back of hands	Rose-coloured spots on abdomen and back	None
Brain symptoms	Apathetic from the first; muttering delirium	Delirium common in second or third week	Delirium common
Epistaxis	Rare	Common	Rare
Bowels	Confined	Relaxed	Confined
Duration of illness	Usually terminates at end of second week	Rarely less than three weeks, usually much longer	Duration usually about three weeks
Jaundice	None	None	Frequently present

along with intense headache, discharge from the eyes and nose, sneezing, sore throat, dyspnœa, cough, expectoration, elevation of the temperature, and other signs of fever.

The disease is *influenza*.

The disease prevails at times as an epidemic in which a large number of persons are attacked simultaneously. It is believed to be infectious. It confers no immunity from subsequent seizures; on the contrary, it often appears to render the affected person especially liable to subsequent attacks. The period of incubation is believed not to be longer than three or four days. The invasion is very sudden, and is attended with great prostration of strength, a rapid rise of temperature, severe pains of the head, back and limbs, white, coated tongue, and loss of appetite. Often severe frontal pain is first complained of; the catarrhal symptoms are at their height on the second or third day, and decline from the fifth to the seventh day. Cough and expectoration frequently remain for some time after the fever. In rare cases there is an eruption on the skin somewhat resembling measles. The temperature usually varies from 102° to 104°, and continues about the same height until the termination of the fever. The pulse is rarely quickened in proportion to the elevation of the temperature, in some instances it remains at or below the normal. Profuse perspirations often occur towards the close of the fever, and may affect the patient for many weeks after convalescence. In some instances the patient is, from the first, drowsy and apathetic, in others pains in the abdomen and diarrhœa constitute the prominent symptoms.

Influenza is sometimes complicated with capillary bronchitis or pneumonia. Fatal cases are chiefly confined to children and aged persons, or to those already affected with some chronic affection of the heart or lungs. The average duration of the complaint is from three to five days in mild cases, and from seven to ten in those more severely affected. It is generally followed by general feebleness and inability for mental or bodily exertion, in others the patient suffers from neuralgia, and in those who are predisposed to tubercular affections phthisis not infrequently follows an attack. A bacillus has been discovered in the expectoration in influenza which is probably the cause of the disease.

690. *e.* After a few hours of slight fever the patient has felt pain in the front of one or both ears, quickly followed by the formation of a firm, elastic swelling in that situation, the movements of the jaw are difficult and painful, the pulse is quick and the temperature increased.

The disease is *mumps* (*Parotitis*).

The complaint is infectious, the period of incubation varying from seven to eleven days. It is most common between the ages of five and fifteen, but may occur at almost any period of life. The fever is rarely high, the swelling of the gland usually increases from the third to the sixth day, remains stationary for one or two days and then quickly subsides, so that the whole duration rarely exceeds fourteen days. In some the submaxillary glands are also inflamed; occasionally the testis in the male or the mamma or labium in the female becomes swollen and painful. The disease is unattended with danger, but it often leaves the patient in a feeble state of health.

Swelling of the parotid or submaxillary glands sometimes occurs during the course of febrile diseases, especially in typhus. Suppuration rapidly takes place, and its occurrence should be regarded as an unfavourable sign.

691. PYÆMIA.—The disease was formerly supposed to arise from the introduction of pus into the vascular system, but this has been proved to be incorrect. It used to be common after the receipt of wounds and injuries, but the employment of antiseptics has almost banished it from surgical practice. It is, however, occasionally met with in medical cases, and it is often very difficult to ascertain the source from which it has arisen.

The symptoms of pyæmia usually commence suddenly with a severe rigor, attended by a rise of temperature to 104° or 105°. This is succeeded by sweating and a fall of the temperature to a much lower point. The rigors return from time to time at irregular intervals, but occasionally they may be repeated daily at about the same hour, as in ague. The temperature is remittent, rising to a considerable height, but falling rapidly to or about the normal (fig. 119). Sometimes the accessions of fever take place frequently during the same day. The usual symptoms of gastric disturbance show themselves, such as dryness of the tongue, excessive thirst, occasional vomiting, loss of appetite, flesh and strength. About the sixth to the tenth day suppuration generally occurs either in the joints, the connective tissue of the limbs, or in one of the internal organs. Thus, there may be acute pleurisy, endo- or pericarditis, or pneumonia, or suppuration may occur in the liver or some other of the internal organs. As the case goes on the pulse becomes excessively feeble, irregular, or intermittent, delirium presents itself, usually of a low muttering form, followed by coma. In medical practice the disease is often caused by suppuration in the middle ear, abscess round the appendix vermiformis, pyelitis, or some other affection of the kidney, but you will also meet with cases where there is an absence of any local indications of disease, and it is only by the most careful examination that you can discover the source of the disorder.

FIG. 119.

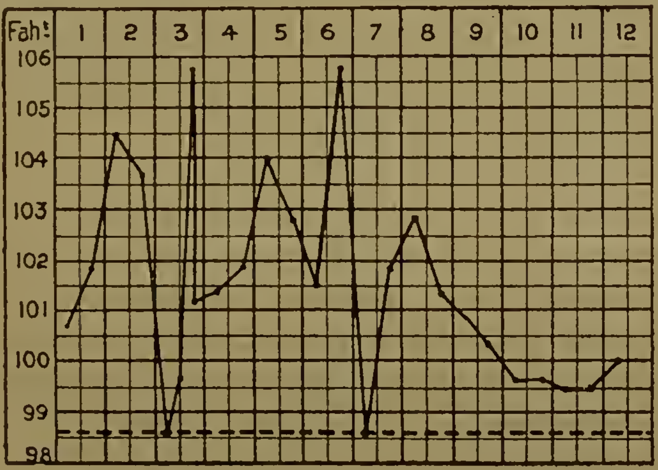


Chart of the temperature in a case of pyæmia.

Micro-organisms are present in the blood and tissues in pyæmia, and the secondary abscesses that present themselves are probably the result of their action on the tissues and fluids of the body. The micro-organisms generally met with are staphylococci and streptococci. Death usually takes place in pyæmia about the end of the first or second weeks, few survive beyond the third week.

692. Occasionally pyæmia occurs in a chronic form, and the case may persist for many months. A succession of abscesses takes place in different parts of the body, accompanied by fever of the remittent type. If there are no local symptoms pointing to the existence of an internal abscess, you should carefully search every organ in turn for some indication of disease. Especially examine the spine and the urinary organs, for these structures are often the seat of suppuration without any complaint of pain or uneasiness being made by the patient.

693. Septicæmia is the term applied to those cases of pyæmia in which no secondary abscesses present themselves. The general symptoms are the same, and it is, in all probability, the result of the action of the same form of micro-organisms. It is distinguished from pyæmia by its more rapid progress, more sustained temperature, and by the absence of the secondary abscesses.

694. Sapræmia is a term applied to a febrile condition similar to pyæmia, but which arises not from the presence of bacteria in the blood or tissues, but from the absorption of the poisonous products resulting from the action of these micro-organisms. In order for its production, there must be some decomposing material which is in contact with a structure capable of absorbing it.

695. Pyæmia may be confounded with ague, typhoid, or rheumatic fever. It is readily distinguished from ague if you can discover some internal suppuration, and if the patient has not been exposed to malarious influence. In ague the rigors occur about the same time of day, and the fall of temperature is complete, whilst in pyæmia the attacks are more irregular, the temperature does not fall to the

normal, and the cerebral symptoms persist in the intervals of the fever. The occurrence of suppuration in the joints or in the connective tissues renders the diagnosis more certain. From typhoid it differs in the frequency and severity of the rigors, followed by profuse sweatings, and attended by a fall of temperature; in the rapidity of its course, the absence of eruption and diarrhœa, and by the occurrence of abscesses or suppuration in the joints. In acute rheumatism there may be a history of former attacks, the inflammation of the joints shifts from one to the other, rigors are not present, the sweating is continuous, not occasional as in pyæmia, the temperature is not so elevated, and the patient does not exhibit the same signs of prostration.

SECTION III

THE PATIENT IS SUBJECT TO PERIODICAL ATTACKS OF FEVER

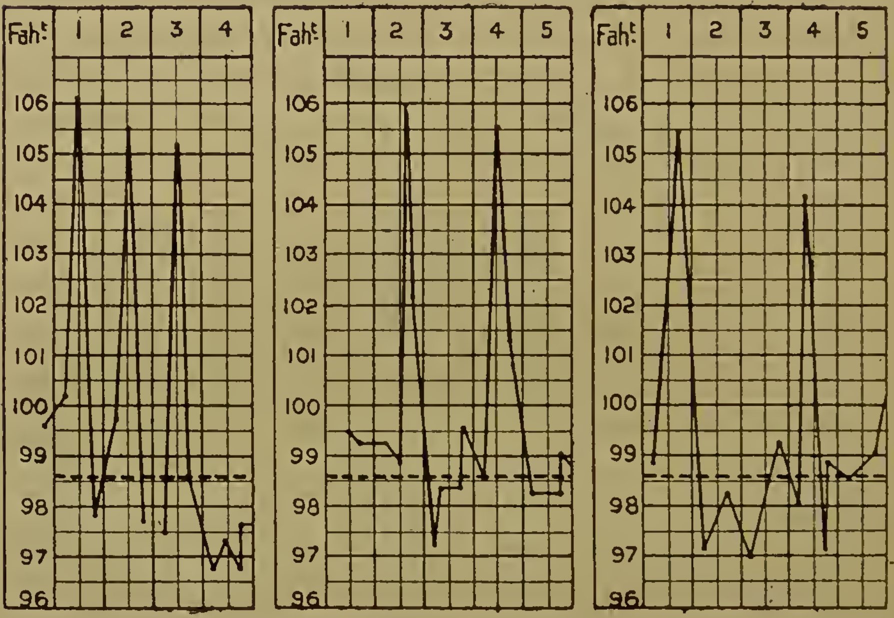
Under this head you only meet with ague in this country.

696. *a.* The patient is periodically attacked with shiverings, attended with quick pulse, uneasiness, oppression of breathing, or sense of fatigue; these are succeeded, after a period varying from half an hour to two hours, by great heat of skin, restlessness, thirst, rapid full pulse, and scanty secretion of urine; afterwards a profuse perspiration breaks out with relief of all the symptoms.

The disease is *ague* (*intermittent fever*).

Intermittent fever occurs in swampy districts, and affects all those who may be exposed to the malaria. Its incubation period is supposed to vary from six to twenty days, but it not infrequently comes on very quickly after exposure to an unhealthy atmosphere. There are three stages in each attack. The cold or first stage, a second attended with increased heat, and a third of profuse sweating. The patient usually feels weak and apathetic before the invasion which is ushered in by a severe rigor. In the first stage, although the skin is cold, the lips and fingers blue, and the teeth chattering, a thermometer placed in the axilla or the rectum shows that the internal temperature has risen. In the hot stage the temperature rises to a still greater height, often attaining 105° or 106°. It falls rapidly during the sweating period. After this the temperature remains at or below the normal point, and the patient returns to his usual health until he is again prostrated by a fresh attack. The liver and spleen are always enlarged, especially the latter, which in long-standing cases may assume very large dimensions. In some cases severe neuralgic affections, recurring at regular intervals, replace the ordinary stages.

FIG. 120.

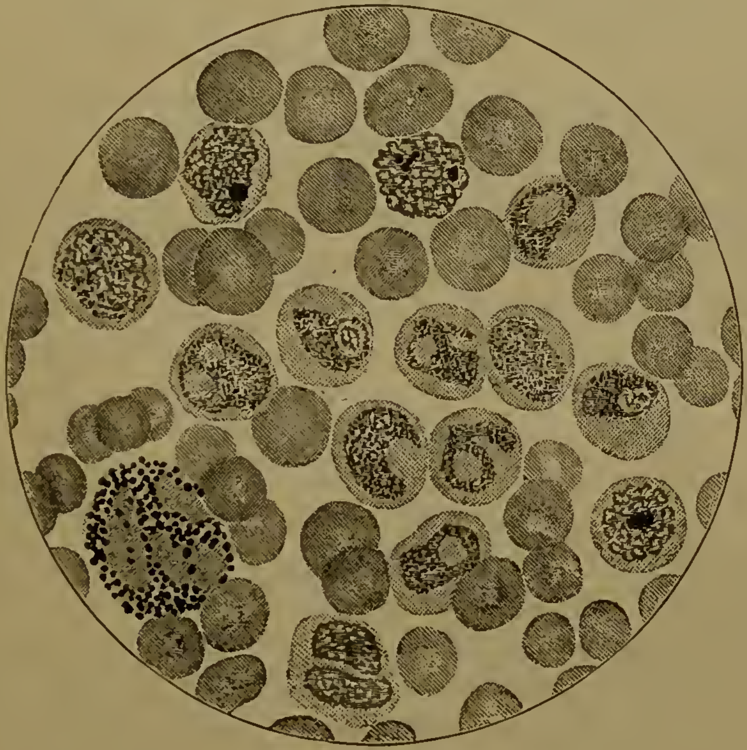


Quotidian. Tertian. Quartan.

Charts of temperatures in different forms of intermittent fever.

Ague occurs under different forms. If the attack occurs daily it is termed *quotidian;* if every forty-eight hours, *tertian;* if every seventy-two hours, *quartan.* It is called *double tertian* when the patient is attacked daily, but the attacks of alternate days alone correspond in severity and time (fig. 120). Persons who have suffered from this fever are very apt to contract pneumonia in case they are exposed to damp or cold. Well marked anæmia is always met with in those who have long suffered from malaria.

FIG. 121.



Showing the malarial parasites affecting and destroying the blood cells. (MANNABERG.)

697. When the blood of a patient who has been long affected with malarial fever is examined with the microscope small brown or black particles may usually be discovered in it. Of course you must wash the surface of the skin before making the puncture, and must be careful that the slide and cover-glass are quite free from dust. Small spherical

bodies have been described as present within the red corpuscles and in the serum, which display active amœboid movements. They contain dark pigment granules, believed to result from the destruction of the hæmoglobin. Flagella have been observed; they present rapid movements, and are attached to some of the large spherical bodies which are free in the serum of the blood. Crescentic bodies have been also remarked in the blood; these are colourless and transparent but contain particles of pigment. The organisms are not bacteria but belong to the group of protozoa, and the whole of the symptoms of the intermittent fever are attributed to their action (fig. 121).

698. The sudden rigor, followed by heat and terminating by sweating, presents so marked a picture that it is difficult to overlook an ordinary case of ague. You may, however, confound it with pyæmia, malignant endocarditis or abscess of the liver. In pyæmia you generally have a history of an injury, or an abscess may be present, the rigor is rarely so long continued as in ague, the sweating follows it more quickly, whilst in ague the patient has lived in a malarious district, and a hot stage intervenes between the rigor and the sweating. In malignant endocarditis there are usually indications of an affection of the heart, the rigor is less marked, the sweatings are less profuse, and the attacks are more irregular in their recurrence. In hepatic abscess the fever is continuous, the patient suffers from pain and tenderness of the right hypochondrium, the liver is large and tender, and the rigors are more irregular. Whenever there is any doubt quinine should be prescribed, which will cut short an ague, but has little or no effect on the other complaints with which you may confound it.

CHAPTER XV

RHEUMATISM, GOUT AND RICKETS

Rheumatism and Gout are characterised by inflammation of the muscular, fibrous, or serous structures of the body; the inflammation seldom goes on to suppuration, and is apt frequently to change its seat. They may give rise to affections of many, if not of all the internal organs. They may attack the patient suddenly, or their course may be slow and lingering.

699. Acute Rheumatism (Rheumatic Fever).—It may occur at any period of life, but is most common between fifteen and thirty, it is rare in infants and in persons above fifty years of age. It is often hereditary, is apt to recur frequently, usually follows exposure to wet and cold, and is occasionally a sequence of scarlatina or chorea. The affection of the joints is generally preceded for twenty-four or forty-eight hours by chilliness, languor, heat of skin, and other symptoms of fever. In others it is ushered in with sore throat attended by fever.

The joints are swollen, hot, red, painful, and excessively tender. The larger articulations are chiefly affected; different joints are either attacked together or in succession, and the pain is so greatly increased by the slightest movement that the patient lies in a helpless condition. The skin is covered with a profuse acid perspiration, having a sour smell, the urine is scanty, high-coloured, and loaded with lithates, the bowels confined, the pulse quick and bounding (90 to 110), the temperature high, but varying from day to day, there is constant thirst, and the tongue is white. The blood contains an abnormal amount of fibrine; in the urine there is an increase of urea and lithic acid, whilst the chlorides are deficient in quantity, or are altogether absent. After a few days of treatment the pains in the joints usually subside, the temperature falls, and the patient is relieved; but in the majority of cases one or more joints are again attacked, the temperature rises, and there is a recurrence of all the previous symptoms. These may disappear, but repeatedly return until convalescence is established. The height to which the temperature rises is usually in proportion to the severity with which the articulations are affected.

700. The most frequent complication of acute rheumatism is an affection of the heart which may show itself at any period of the disease. It probably takes place in about 30 to 50 per cent. of those who suffer from the fever. It is especially apt to occur in children and young persons. Endocarditis is the most common heart lesion and is generally unattended with any marked symptoms, but a murmur can be detected with the stethoscope at the apex or the base of the heart. Pericarditis is less frequent, is often accompanied with pain and difficulty of breathing, and can be distinguished from other affections by its physical signs. More rarely there is pleurisy with effusion, and occasionally pneumonia. As pericarditis or endocarditis occurs in a large proportion of the cases, and as these diseases are often unattended by pain, or other symptoms tending to direct attention to the heart, you should examine the chest daily with the stethoscope. The profuse sweating is often accompanied by an eruption of sudamina, in others erythema, or more rarely a purpuric rash, presents itself about the ankles or feet. Small, fibrous nodules may sometimes be discovered over the knees, ankles, and elbows, especially in children.

In rare cases a considerable rise of temperature takes place, so that it may reach 105°, 107°, or even 110°.

Such cases of *hyperpyrexia* are accompanied by flushing of the face, rapid and difficult breathing, sleeplessness, and delirium, followed by coma. Death rapidly takes place unless appropriate treatment is promptly employed.

701. Acute rheumatism before the joints have become affected may be confounded with influenza or any of the acute infectious fevers. You should in such a case inquire whether the patient or any of his relatives has suffered from previous attacks of rheumatism, if he has been exposed to cold or wet, if he has had inflammation of the throat, and examine if there is a murmur over the heart's region. After the joints have become inflamed, it may be confounded with pyæmia. In the latter, however, there is usually a history of an injury or operation, or the patient, if a female, has been recently confined; the articular inflammation does not shift from place to place, the temperature is higher and more variable, the sweating is less constant, and the strength of the patient is much more depressed than in acute rheumatism.

702. SUB-ACUTE RHEUMATISM.—The pain and swelling of the joints are less, the fever is not so intense, and liability to affection of the heart is not so great as in the acute form. A variety of it is often met with in persons suffering from gonorrhœa, and is termed *gonorrhœal rheumatism.*

703. Gonorrhœal rheumatism may be mistaken for ordinary acute or subacute rheumatism, but the articular inflammation does not shift from joint to joint, but remains fixed in those that are first attacked. The temperature is not much elevated, there is an absence of sweatings, the heart is rarely affected, and there is a history of urethral discharge to guide you in your diagnosis.

704. CHRONIC RHEUMATISM may remain as the result of rheumatic fever, or it may attack those who have been previously healthy. There is no fever, but the parts affected are painful and tender, and the suffering is increased by motion. When it occurs in the joints adhesions are apt to take place, so that the movements of the

limb become restrained, and you can often feel a grating on moving the joint, when the hand is placed over it. Chronic rheumatism is most generally met with in persons advanced in life.

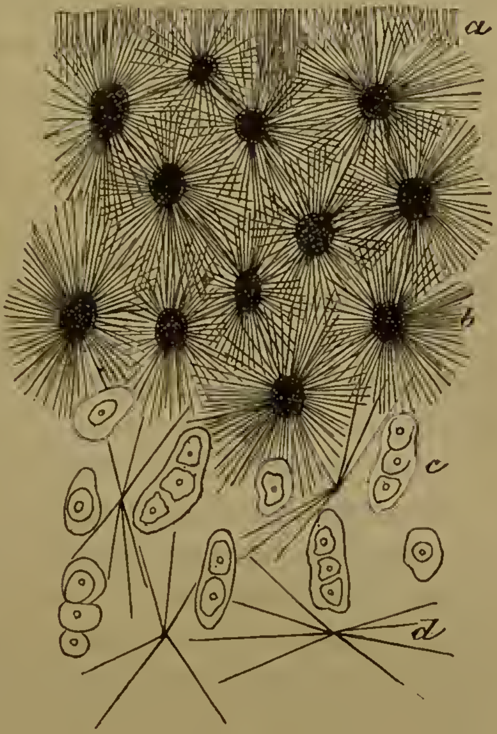
705. Rheumatism is often named according to the structure affected. Thus lumbago, or rheumatism of the muscles of the loins, is termed *muscular rheumatism;* when the periosteum is inflamed it is termed *periosteal rheumatism.* In the diagnosis of local rheumatism, you must first exclude all other causes likely to produce the pain of which the patient complains; for instance, pain of the loins may arise from a disease of the spine or kidneys, from aneurysm of the aorta, affections of the testes in the male, or of the uterus or ovaries in the female. If, then, you meet with a case of long-standing pain in this region, you should first ascertain that none of the above complaints are present before concluding that rheumatism is the cause of the suffering.

706. When the muscles of the chest are affected it is termed *pleurodynia* or *intercostal rheumatism.* There is pain in the chest, increased by coughing or other movements, and tenderness on pressure, but fever and increased rapidity of the pulse are absent. When it is associated with cough and other symptoms of catarrh you may find it difficult to distinguish it from pleurisy. The absence of an elevation of the temperature and of increased rapidity of the pulse and of the physical signs of pleurisy will generally enable you to arrive at a correct diagnosis.

707. GOUT.—In a joint that has been only slightly affected with gout a white, powdery deposit will be found on the cartilages and on the surface of the ligaments. The deposit is composed of urate of soda, and is probably permanent. It is situated in the substance of the cartilage, but is most dense towards the surface. In severe cases a large portion of the articular surface may be found thus altered, the synovial membrane is thickened, and the ligaments rendered rigid from infiltration with urate of soda.

Microscopically, the urate of soda appears in the form of fine crystalline needles or prisms closely interlaced (fig. 122). The blood in gouty persons also contains the same substance, and in some instances oxalic acid has been detected. Chalk stones, which consist also of urate of soda or lime, are apt to form in the helix of the ear, the joints of the fingers, and other exposed parts of the body.

FIG. 122.



Vertical section through an articular cartilage infiltrated superficially with urates. *a.* The surface. *b.* Cartilage cavities with tufts of crystals. *c.* Cartilage cells not yet infiltrated. *d.* Isolated needle-shaped crystals. (CORNIL and RANVIER.)

Gout is hereditary; it never attacks children, and men are more liable to it than females, who seldom suffer from it until after the cessation of the catamenia. It rarely occurs below thirty years of age. It is apt to be induced by free indulgence in wines and malt liquors, by excess of animal food, and by severe mental exertion. Workers in lead are especially liable to be affected by it.

Gout occurs as an acute or chronic affection.

In *the acute form* a first attack generally takes place in the ball of the great toe. It may occur suddenly or be preceded by symptoms of dyspepsia. During the night the part becomes painful, red, swollen, and very tender, the veins proceeding from it being distended with blood. The temperature will be found to be raised to perhaps 102° or 103°, the pulse is quickened, the tongue foul, the appetite diminished or lost, the bowels constipated, the urine high coloured and loaded with lithates. During the day, the patient is easier, but the pain returns at night and is attended with an elevation of the temperature. After a time, varying from three to ten days, the fever disappears and the patient's condition improves. As the swelling of the joint increases, the pain lessens, the skin becomes œdematous, and when the attack subsides the cuticle generally desquamates. The fit usually recurs within twelve months, and as time goes on a number of the articulations become affected at once.

In *chronic gout* the pain is almost constant, and the affected joints are swollen, stiff, thickened, and deformed, whilst there are frequent attacks of an acute or subacute character. Tophi may be situated in the skin over the joints or in the cartilage of the ears, or there may be small nodules in the inner parts of the eyelids. The general health of the patient deteriorates; he is incapable of much exertion, the digestion is impaired, and he often becomes the subject of valvular affection of the heart or of granular disease of the kidneys.

708. Acute gout may be distinguished from rheumatic fever by the former usually affecting men of middle or advanced age, the latter young persons of either sex. Gout usually attacks the smaller joints, and persists for some time; as the pain lessens, the skin becomes œdematous and the veins distended. Acute rheumatism affects the larger joints, rapidly changing from one to the other; the skin over them is not shining, and there is no œdema. In acute gout the temperature is not high, the pain is worst at nights, the skin does not perspire freely, and there is usually a history of a previous attack which had commenced in the joint of the great toe; in acute rheumatism the fever is severe, and there is a liability to pericarditis and endocarditis.

709. Sir Alfred Garrod has proposed the following method of ascertaining the presence of uric acid in the blood of gouty

patients.: "Take from one to two fluid drachms of the serum of the blood (or of the fluid obtained from a blister) and put it into a flattened glass dish or capsule; those I prefer are about three inches in diameter, and one-third of an inch in depth, which can be readily procured at any glass-house; to this add ordinary strong acetic acid in the proportion of six minims to each fluid drachm of serum, which usually causes the evolution of a few bubbles of gas. When the fluids are well mixed introduce a very fine thread, consisting of from one to three ultimate fibres about an inch in length, from a piece of unwashed huckaback, or other linen fabric, which should be depressed by means of a small rod, as a probe or point of a pencil; the glass should then be put aside in a moderately warm place until the serum is quite set, and almost dry; the mantelpiece in a room of the ordinary temperature, or a bookcase, answers very well, the time varying from twenty-four to forty-eight hours, depending on the warmth and dryness of the atmosphere. Should uric acid be present in the serum above a certain small amount it will crystallise, and during its crystallisation will be attracted to the thread, and assume forms not unlike that presented by sugar-candy on a string. To observe this, the glass containing the dried serum should be placed under a linear magnifying power of about fifty or sixty, procured with an inch object-glass and low eye-piece, or a single lens of one-sixth of an inch focus answers perfectly."

710. RHEUMATOID ARTHRITIS (RHEUMATIC GOUT).—This complaint may occur in an acute or chronic form, the latter being the more common. In chronic cases, Sir A. Garrod states "that the fibro-synovial structures of the joint are much altered, the capsules distended with synovial fluid, and exhibit signs of chronic inflammation: the synovia afterwards becomes absorbed, leaving the capsular membrane much thickened. The internal structures—as the round ligament in the hip-joint, the tendon of the biceps in the shoulder—become destroyed and sometimes entirely

removed. When the disease has been long in a joint the articular cartilages are absorbed, and in certain very old cases even the inter-articular cartilages : this is seen in the knee-joint, the wrist, and the lower jaw. From the amount of distention caused by the fluid in the early stages, the different ligaments become elongated and are slow to recover their natural state, and the joints are thus rendered mobile and more subject to dislocation. When the articular cartilages have been completely removed, their place is supplied by an ivory-like enamel, remarkable for its polish and hardness; in some joints this covers the entire end of the bone, in others in streaks or patches in the direction of the movement of the joint. The denuded surfaces become partly worn away, and a smooth enamel is formed by the natural action of the bones on each other; and around the articular surfaces thus acted upon, bony vegetations arise."

In *acute rheumatoid arthritis* one or more joints are attacked with severe pain, increased on pressure or motion, but the inflammation persists in the joint first affected, although others may be afterwards implicated. There is no sweating, and the temperature is lower than in rheumatic fever. The hip is the most common seat of the disease; the duration of the illness is often tedious, and stiffness or anchylosis not infrequently results.

Chronic rheumatoid arthritis chiefly affects persons of a delicate constitution, and is most common amongst females at the commencement or termination of menstruation. It occasionally follows acute rheumatism, but more generally it comes on without any apparent reason. The disease commences with swelling, pain, and stiffness of one or more joints; those of the fingers being generally first attacked. After a time the swelling gradually subsides, but imperfect motion remains, the muscles become wasted, and the joint distorted. Only one or many of the joints may be thus affected, and in the latter case the powers of movement are often so completely destroyed that the patient becomes a helpless cripple.

711. **Rickets** is a disease of childhood attended by enlargement of the joints and a soft condition of the bones. It usually appears between the ninth and eighteenth months and affects both sexes equally. It appears to be due to imperfect nutrition and unhealthy surroundings, so that the children of the poorer classes are the chief sufferers.

It begins very gradually, the first symptoms being flatulence, diarrhœa, and other evidences of disordered digestion. The child is restless at nights, peevish and irritable in the daytime; the limbs are often tender on pressure, so that it objects to being handled, and it sweats profusely about the head and neck during sleep. If it has been able to walk it becomes unsteady or loses altogether the power of standing, but can move the limbs freely in the recumbent posture. The head is large and square, the fontanelles are late in closing, the ribs present nodules at their junction with the cartilages, the lower ends of the radius and ulna in the arm, and of the lower part of the tibia in the leg become enlarged, and the teeth are late in making their appearance. The ribs sink inwards outside the sternum, and that bone in its lower half projects forwards producing the appearance of a "pigeon-breast," whilst the legs and sometimes the arms become bent and deformed.

The liver and spleen are usually found to be increased in size, and the child is liable to attacks of laryngismus stridulus (98), tetany (590), convulsions (587), and infantile scurvy (730).

712. At an advanced period of the disease the shape of the head, the nodules on the ribs, and the deformities caused by the bending of the long bones render the diagnosis easy, but there is often difficulty in the early stages. It may, however, be suspected when a child suffers from repeated attacks of disordered digestion, if it is restless at nights, sweats freely about the head during sleep, if there is marked tenderness of the limbs, and the teeth are delayed in making their appearance.

CHAPTER XVI

DISEASES OF THE BLOOD AND DUCTLESS GLANDS

713. THYROID—*Goitre.*—This disease consists in an enlargement of the thyroid gland, which may affect either one lobe or both. In most cases the increase in size is due to simple hypertrophy of the glandular structure, which may subsequently develop cysts (*cystic goitre*), or undergo fibrous induration. In *exophthalmic goitre* the gland is slightly hypertrophied and abnormally vascular, and is associated with hypertrophy of the left ventricle of the heart.

In *Atrophy of the Thyroid*, the gland is diminished in size, is of a pale yellow colour, and presents condensation of its tissue from chronic interstitial inflammation. The disease is usually accompanied by the symptoms of *myxœdema.* Atrophy of the thyroid is sometimes met with in cases of *cretinism,* but more commonly goitre is present in it.

The principal tumours of the thyroid consist of *cancer* and *sarcoma.*

714. THE SUPRARENAL BODIES.—These glands are liable to a local form of tuberculosis which is accompanied by pigmentation of the skin, vomiting, and a weak action of the heart (*Addison's disease*). The glands are enlarged, and their substance is replaced by caseous material and fibrous tissue. In early cases tubercles may be observed, but at a late stage both organs are completely destroyed. In many instances the semilunar ganglia and the solar plexus are also diseased.

Amongst the other diseases to which these glands are liable are *cancer*, *sarcoma*, *hæmorrhage*, and *fatty* and *lardaceous degenerations*.

Diseases of the Spleen

715. The principal diseases of the spleen are, congestion, inflammation, leukæmia, lardaceous degeneration, and tumours.

Congestion of the spleen may be active or passive. The former chiefly occurs in acute specific fevers, such as typhoid, typhus, and pyæmia. Passive congestion results from dilatation of the heart, or from obstruction of the portal circulation in cases of cirrhosis of the liver.

Inflammation of the spleen occurs as an acute disease in cases of embolism of the organ, and as a chronic condition in ague. Occasionally the capsule becomes greatly increased in thickness (*perisplenitis*).

In *Leukæmia* the organ is enormously increased in size and weight. In the early stages the vessels are merely engorged with blood; but subsequently the Malpighian bodies enlarge and the spleen becomes hard, dense and pale, and frequently adherent to the diaphragm. The disease is accompanied by a great increase in the number of the white corpuscles in the blood.

The *lardaceous* or "sago" spleen is somewhat larger than normal. On section the Malpighian bodies appear as transparent spots, similar to boiled sago grains, which are rendered dark-brown by iodine. Microscopically, the disease is seen to commence in the middle coats of the vessels of the Malpighian bodies, whence it often spreads to the pulp-tissue.

Tuberculosis occurs in the form of minute granulations in cases of general miliary tuberculosis, and occasionally as small caseous tumours in children who are the subjects of scrofulous disease of the lymphatic glands of the abdomen.

Gummata, *secondary cancers*, and *hydatid cysts*, are occasionally met with.

716. The blood is, no doubt, continually changing, both in respect to the nature of its constituents, and also in the relative quantities of the different materials of which it consists. We are, however, very imperfectly acquainted with the chemical alterations that take place in various disorders, and are forced to assume that some important changes have occurred, when we meet with grave constitutional symptoms associated with disease of one of the organs whose function we know it is to assist in the formation or purification of the circulating fluid. Of late years, great attention has been bestowed upon the microscopic appearances presented by the blood in different maladies, and considerable variations in the amount of the hæmoglobin, and in the appearances and relative numbers of its corpuscles, have been discovered.

717. Various methods have been proposed for the estimation of the amount of the hæmoglobin, but that recommended by Dr. Gowers is generally employed in this country.

In Dr. Gowers' hæmoglobinometer "the blood is progressively diluted until it reaches the tint of a standard, the colour of which corresponds to a dilution of one part of healthy blood in 100 of water. The degree of dilution necessary to make the two correspond represents the amount of hæmoglobin. The apparatus consists of two tubes of exactly equal diameter, and a capillary pipette holding 20 cubic mm., for measuring the blood. One tube is filled with a standard, consisting of glycerine jelly, coloured to the required tint. The other is graduated, each division being equal to the volume of blood taken (20 cubic mm.), so that 100 divisions equal 100 times the volume of blood. The dilution is made by a pipette stopper, and distilled water; the number of degrees of dilution necessary to produce correspondence with the standard indicates the percentage proportion of the hæmoglobin of the blood examined compared with normal blood. For example, the blood of a patient, being progressively diluted, is found to reach the tint of the standard when the amount of water added corresponds to 45 degrees of dilution; the blood examined therefore contains 45 per cent. of the normal quantity of hæmoglobin." *

718. In practice the estimation of the amount of hæmoglobin in the blood is rarely required, but you will constantly find it necessary to ascertain the relative numbers of the white and red corpuscles of the blood. For this purpose an instrument has been devised by Dr. Gowers which will often afford you most valuable information.

"The apparatus consists of a pipette graduated to 995 cubic mm., for measuring the diluting solution; a capillary tube for measuring the blood, containing 5 cubic mm.; a small glass jar and stirrer for making the dilution; and the cell for counting, ·2 mm. deep, and ruled at the bottom in squares, each ·1 mm. in length and breadth. The slide bearing the cell is fixed on a small metal plate, to which two springs are attached; these keep the covering glass in position, and secure uniformity in its pressure on the cell, and therefore in the depth of the contained liquid.

"Various solutions have been employed for making the dilution. That which the writer has found to answer best, as differentiating most clearly the red and white corpuscles, consists of sulphate of sodium, 104 grains; acetic acid, 1 drachm; distilled water, 6 ounces.

"In using the hæmacytometer, a drop of the dilution is placed in the centre of the cell, the cover-glass and springs are applied, and in a few minutes the corpuscles have sunk to the bottom of the cell, and are seen lying within the squares. The dilution of 5 cubic mm. of blood in 955 cubic mm. of solution, is one in 200; each square contains the corpuscles from a volume of dilution, ·2 mm. in one, and

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* Dr. Gowers, Quain's "Dictionary of Medicine," art. "Hæmoglobinometer."

·1 mm. in each of the other dimensions—that is, 2 cubic ·1 mm., or the ·002 part of a cubic mm. But the dilution being one in 200, this volume of dilution contains just .00001 cm. of blood. The number of corpuscles in a square, multiplied by 100,000, is thus the number in a cubic mm. of blood—the common mode of statement. In order to limit error, the number of corpuscles in ten squares should be counted, and this number multiplied by 10,000 is the number per cubic mm. The average number in health is about 5,000,000. Blood of normal richness thus contains about fifty corpuscles per hæmacytometer square. Therefore the number in two squares of the instrument will always represent the proportion of the corpuscular richness compared with that of normal blood (= 100), that is, the percentage proportion to the normal. It is, therefore, convenient to take the volume of blood represented by the two squares (·00002 cubic mm.) as the standard volume, or 'hæmic unit.' For instance, it is found that the blood diluted presents in ten squares 375 corpuscles, or 75 in two squares ('hæmic unit')—that is, 75 per cent. compared with the normal. To learn the number per cubic mm. we have only to multiply 375 by 10,000 = 3,750,000.

"In counting the white corpuscles, if they are not in considerable excess, it is most convenient first to ascertain the number of red corpuscles per square, and note how many squares are contained in a field of the microscope. If, then, the focus is raised, so that the corpuscles become indistinct, the white ones, from their higher refracting power, will appear like bright points, and the number in a series of fields can easily be counted. For example, the number of red corpuscles per square has been found to be forty, and the field contains fifteen squares—that is, 600 corpuscles per field. Ten fields contain fifteen white corpuscles; the proportion of white to red will therefore be 1 to 400."*

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* Dr. Gowers, Quain's "Dictionary of Medicine," art. "Hæmacytometer."

719. Various names have been employed to distinguish a deficiency of the various constituents of the blood, but the term Anæmia seems to be the most simple and appropriate. Usually, you can distinguish this condition without any difficulty; the skin is pale, the lips and mucous membranes of the throat are comparatively bloodless, you can hear a well-marked systolic murmur at the third left costal cartilage extending upwards to the clavicle, and, more rarely, there is also a murmur at the apex of the heart. When the patient stands or sits upright and inclines the head to the left side, a continuous murmur can be often distinguished when the stethoscope is slightly pressed over the right jugular vein.

720. A deficiency of blood, however it may have been produced, gives rise to a number of very characteristic symptoms. Attacks of palpitation are common, difficulty of breathing is produced by any excitement or bodily exertion, and the pulse is soft, feeble, often irregular. The appetite is impaired, pain often comes on shortly after food, there is a tendency to flatulence, and constipation is almost always present; the urine is pale, copious, and of low specific gravity. The patient complains of weakness and incapability for mental or bodily exertion, and is liable to faintings on exertion or excitement.

721. You will meet with anæmia as the result of a large number of diseases and its recognition is of great importance. Hæmorrhage is, of course, a common cause, so that a loss of blood from the lungs, stomach or intestines often precedes it. It occurs after all acute infectious disorders, especially after scarlatina and small-pox. It presents itself in various degrees in all chronic disorders, in which it has been necessary either to subject the patient to a restricted amount of food, or where he has been affected with dysentery, diarrhœa or albuminuria. In the case of the female, leucorrhœa and prolonged lactation are frequent causes of anæmia.

722. The commonest form of anæmia is met with in

young females from fifteen to twenty-five years of age, and is termed *chlorosis*. The colour of the skin is often of a yellowish green, and the patient complains, in addition to the usual symptoms of anæmia, of pain in the side, headache, and severe neuralgic pains in different parts of the body. Palpitation, breathlessness, and general debility are prominent symptoms, there is often œdema of the ankles and a tendency to the formation of emboli in the blood-vessels. The catamenia are always scanty or suppressed. On microscopic examination, the number of the red blood corpuscles is found to be lessened, and there is a still greater diminution in the quantity of the hæmoglobin. The number of the white blood-cells is not increased to any great extent. As in all cases of anæmia, there are occasional rises of the temperature, especially towards evening.

In any case in which you suspect the symptoms to arise from an affection of the blood, first ascertain if there is well-marked anæmia, if so begin at (723); if there is no anæmia, but one of the blood-making organs—viz., the spleen, lymphatic glands, or thyroid appears to be enlarged, refer to (736).

SECTION I

There is Well-Marked Anæmia

723. You must bear in mind that anæmia may be the result of hæmorrhages, of various acute and chronic affections, of poisoning by lead or other minerals, and that it constantly occurs in young females and boys who are growing quickly; but in all these improvement takes place under appropriate treatment. The cases, therefore, which you refer to a morbid state of the blood are those that commence without apparent cause and steadily progress in spite of treatment. Examine a drop of the patient's blood taken from the

finger or lobe of the ear, and ascertain if there is an increase of any white blood cells, if so refer to (731); if the white corpuscles are not much more numerous than in the normal state begin at (724).

724. **A. There is well marked anæmia without increase of the white corpuscles.**

725. *a.* The patient is of middle age and presents the appearance and symptoms of extreme anæmia. The complaint has commenced insidiously and has steadily progressed in spite of treatment, the blood under the microscope shows a great deficiency of the red corpuscles, but the hæmoglobin is not diminished in the same proportion.

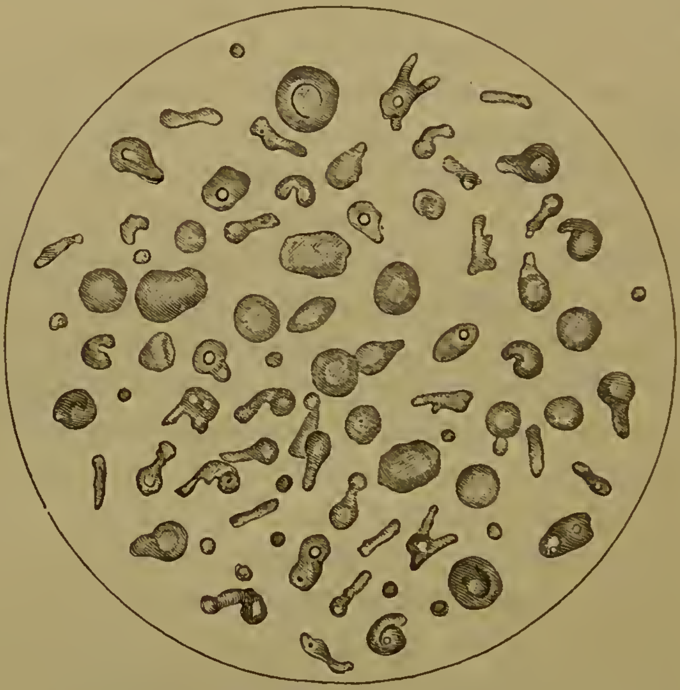
The disease is *progressive anæmia* (*pernicious anæmia*).

The complaint is usually found in persons of middle age and affects both sexes. In the female it occasionally follows pregnancy. In the majority of instances, the symptoms come on very gradually, and the pallor of the skin and general debility are the first indications of illness. The skin is of a lemon-yellow colour, there are great feebleness and inability for any mental or bodily exertion, but the patient is not emaciated, on the contrary, he often remains stout. He suffers from palpitation and breathlessness, severe headache and giddiness, the appetite is bad, especially for animal food, there may be pain and occasional vomiting after food, the bowels are often alternately relaxed and confined. The urine is usually high coloured, of high specific gravity, often contains indican. The temperature often rises and may continue elevated for days or weeks.

Under the microscope the red blood corpuscles are found greatly lessened in number, although their colour is not diminished. They vary much in size and shape. Some are nucleated and much larger than normal (*macrocytes*), others pear-shaped or irregular (*poikilocytes*), some small and imperfectly developed (*microcytes*). The white cells are not increased in number (fig. 123). The patient is liable to bleedings from the nose and other parts, and hæmorrhages can be usually detected in the retinæ with the ophthalmoscope. After death, there is fatty degeneration of the heart, often atrophy of the tubules of the stomach, sometimes redness of the marrow of the bones, and in most cases an increased amount of iron can be detected in the liver.

726. Scirrhus of the stomach, in which no tumour can be detected, is most apt to be confounded with pernicious anæmia. In cancer there is, however, always emaciation, in anæmia the patient is usually stout ; pain or uneasiness after food and coffee-ground vomiting are marked in the former, but are usually absent in the latter ; the temperature is generally subnormal in cancer, whilst it is often elevated in anæmia. The progressive nature of the symptoms, the absence of a cause capable of producing it, the patient being

FIG. 123.



Blood globules in pernicious anæmia. (After QUINCKE.)

in middle life, the frequent elevations of temperature, the great diminution in the numbers of the red blood-cells, with well-marked variations in their sizes and shapes, without a corresponding diminution in the hæmoglobin, will suffice to distinguish it from other forms of anæmia.

727. *b.* The patient, who is usually young, is very anæmic, suffers from great debility and prostration and from attacks of nausea or vomiting. He presents patches of a brown or dark colour on various parts of the skin or mucous membranes.

The complaint is *Addison's disease.*

It most often occurs in the male sex, between the ages of twenty and forty. It has been known to follow injuries, and is sometimes associated with a tubercular affection of the spinal column. It comes on very insidiously with general loss of strength, but without emaciation. The patient becomes pale and anæmic, he complains of palpitation, breathlessness on exertion and incapability for mental or bodily exertion. The appetite is bad, he is subject to attacks of nausea and vomiting, and to pain in the epigastric and hypochondriac regions which are generally tender upon pressure. The heart's action is quick and feeble. The patches of dark colour are most generally found in the mucous membrane of the mouth, on the face, neck and hands, or wherever the skin has been subjected to irritation or pressure, but the disease may run its course without any pigmentation of the surface. The temperature is usually subnormal. There is a diminution in the number of the red corpuscles, but there is no alteration in their size or shape, the white cells are not much, if at all, increased.

The disease ends fatally, and death often takes place suddenly. On post-mortem examination the supra-renal bodies are found to be destroyed by tubercular disease.

728. *c.* The patient suffers from anæmia and general feebleness, attended with enlargement of the glands of the neck or axilla. The number of the red corpuscles is usually lessened, but they are not altered in size or

shape. The white cells are little, if at all, increased in number.

The disease is *lymphadenoma* (*Hodgkin's disease*).

The complaint is most common in the male sex. It may affect children, but is generally observed in early adult life. It comes on very gradually: the glands of the neck in most instances are first affected, but they are usually followed by a similar condition of those of the axilla and groins. The glands of the chest and abdomen are much more rarely implicated. The enlargement commences as a number of separate, soft, elastic tumours, which become afterwards united into a mass of considerable size. The glands scarcely ever suppurate or caseate. There are the usual symptoms of anæmia, such as palpitation, dyspnœa, headache, general weakness, and inability for mental or bodily exertion. The liver and spleen are usually enlarged, but not to an extreme degree. The temperature is elevated from time to time, and may remain so for days or even for weeks. The red corpuscles are sometimes greatly reduced in number. Hæmorrhages frequently take place from the various mucous membranes.

After death, in addition to the enlargement of the affected glands, isolated masses of adenoid growths are usually discovered in the spleen, liver, and kidneys.

729. *d.* The patient is very anæmic, feeble, and incapable of exertion. The gums are swollen, spongy, and readily bleed. There are ecchymoses on the skin of the lower extremities. The patient has been confined to a diet from which vegetables have been excluded.

The disease is *scurvy*.

The complaint is now rarely seen, but it used to be common in sailors who had been for a length of time confined to salted food. It comes on insidiously with pallor of the skin, general weakness, and incapability for exertion. As the disease progresses, the gums become swollen, readily bleed, and the teeth are loosened and often fall out; hæmorrhage is apt to occur from the nose, and ecchymoses show themselves, chiefly on the lower limbs. A hard, brawny swelling affects the legs, sometimes also the arms, and node-like elevations may present themselves over the tibiæ. The skin is dry, the temperature not elevated, the patient suffers from palpitation and dyspnœa on exertion. The bowels are usually constipated, but it is not uncommon for the complaint to be associated with dysentery. The urine is occasionally albuminous, there is a diminution in the red, but no increase in the number of the white corpuscles. The exact nature of the changes in the blood that occur in scurvy is still undetermined.

730. Children who have been brought up on artificial foods from which milk has been excluded are apt to be affected with a form of scurvy.

731. **B. There is anæmia accompanied by an increase in the white corpuscles of the blood.**

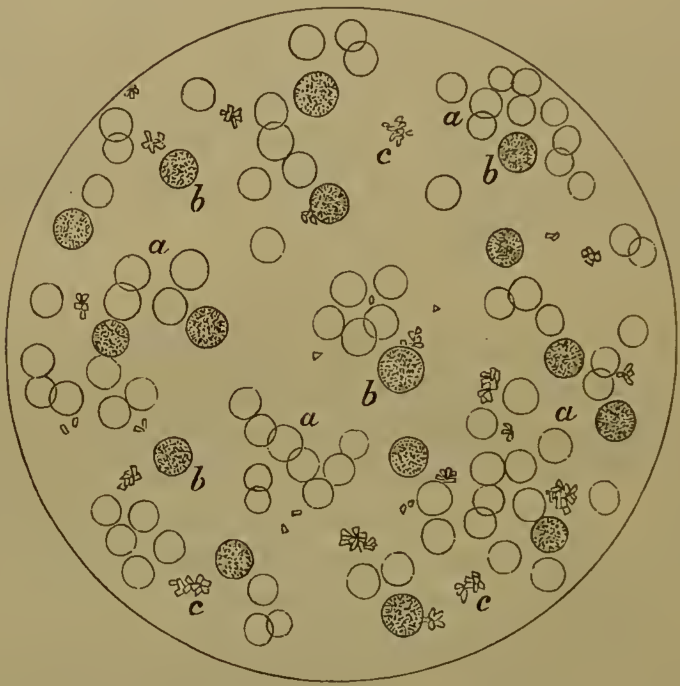
You must bear in mind that the proportion of the white corpuscles to the red varies under different circumstances. They are normally more numerous during the process of digestion, but they may be also proportionately increased in cancer and other wasting disorders.

732. *a.* The patient is anæmic, very feeble, liable to palpitation, dyspnœa, and hæmorrhages from the mucous membranes. The spleen is found to be greatly enlarged, and the blood shows a diminution in the number of the red, and a large increase in the number of the white corpuscles.

The disease is *leucocythemia.*

It is commonly met with in the male sex, and may occur at all ages, but is most frequent between the ages of thirty and forty. It has been attributed to malarial infection, but in most cases no cause can be assigned for its occurrence. In rare instances it has followed shortly after an injury. It commences insidiously, the patient first experiencing general debility and incapability for his usual exertion. He becomes pale, loses flesh, is liable to palpitation, dyspnœa, and frequent attacks of diarrhœa. There is a sense of fulness in the abdomen, and on examination the spleen is easily detected projecting below the ribs, often attaining so great a size as to fill a large part of the abdomen. Bleeding often occurs from the mucous membranes, and retinal hæmorrhages can be usually found in the eye with the ophthalmoscope. Œdema of the legs and ascites or hydrothorax often show themselves at a late period of the case. Through the whole illness there are repeated elevations of temperature that may last for days or even for weeks.

FIG. 124.



Showing the microscopical appearance of the blood in leucocythemia. *a*. Red corpuscles. *b*. White corpuscles in greatly increased numbers.

Under the microscope the number of the red corpuscles is found to be greatly lessened, even as much as one-half of the normal amount. The white cells, instead of being in the normal proportion to the red cells of 1 to 500, may be 1 to 5 or 10, or in some recorded cases have even exceeded them in number (fig. 124). On post-mortem examination, the spleen is seen to be greatly increased in bulk and weight. It is firm on pressure, and on section the Malpighian corpuscles are found to be increased in size. The liver is also enlarged, but not to the same extent as the spleen. The lymphatic glands are often somewhat hypertrophied.

733. It will be observed that the various blood disorders above described are usually accompanied by hæmorrhages, but a tendency to bleeding also presents itself in a large number of acute and chronic disorders. Thus it may occur in infectious fevers, such as measles, scarlatina, small-pox, &c.; in diseases of the liver and kidneys, and in endocarditis; occasionally it presents itself, after the use of iodide of potassium or chloral hydrate, in persons who are very susceptible to the action of these drugs.

734. When the hæmorrhage takes place into the skin it is said to be *purpuric*, and a condition in which extravasations into the skin form the most prominent feature of the complaint is named *purpura*.

A *purpuric rash* often presents itself in persons who have been previously in good health. When the spots of extravasation are very small they are known as *petechiæ*, if more extensive they are named *ecchymoses*. A form of purpura (*P. simplex*) occurs, in which the spots are of small size and are situated chiefly on the legs and ankles. It is usually preceded for a few days by a feeling of debility and loss of appetite. There are no bleedings from the mucous membranes and the patient generally recovers in a week or two. This form of rash sometimes accompanies pains in the joints, elevation of temperature, and the other symptoms of acute rheumatism. *Purpura hæmorrhagica* is a more severe form of the disease and is attended by great debility, and sometimes proves fatal by hæmorrhage from the lungs or into the substance of the brain. It is believed to arise from an abnormal condition of the blood, which becomes extravasated from the vessels.

735. You are most likely to confound purpura with scurvy, but in the latter there is a history of an absence of vegetable food from the diet, the gums are swollen, spongy, and bleed readily, the teeth are often loose and the breath fetid. There are brawny swellings on the lower limbs, the patient is anæmic, emaciated, and feeble, he has complained of dyspnœa on exertion, palpitation, and œdema of the legs; the appetite is bad, and the temperature below the normal point.

SECTION II

ANÆMIA IS NOT THE PROMINENT SYMPTOM OF THE DISEASE

736. Both of the following diseases seem to be connected with morbid states of the thyroid body.

737. *a.* The patient, who is generally a female, presents a very marked projection of the eyeballs, enlargement of the thyroid body, and an increased rapidity of the heart's action.

The disease is *exophthalmic goitre* (*Graves' disease*).

Graves' disease is much more common in the female than in the male, and occurs chiefly in the earlier part of middle life. The complaint is almost always chronic, and palpitation is usually the earliest symptom; the patient is sallow and anæmic, generally irritable, often sleepless, the temperature is slightly elevated (100° to 101°), and, in the case of the female, the catamenia are usually irregular or absent. The eyes may project to such an extent that the eyelids are unable to close. In most cases when the patient looks suddenly down, there is not the usual corresponding depression of the upper lids, but this symptom is not always present. The thyroid is enlarged on both sides, but rarely to any great extent. It feels soft, and the increased bulk is due to the enlargement of its vessels, but at a late period it often becomes hard from fibroid change. The carotids pulsate with increased force, a thrill can be felt over the thyroid, and the stethoscope detects a murmur which is usually loudest at the edges of the swelling. There is increased pulsation of the heart, which beats over an enlarged area. There is often a systolic murmur at the third rib, more rarely at the apex. Hypertrophy and dilatation are apt to take place in cases of long standing.

738. *b.* The patient, who is usually a female, presents a pallid, unhealthy complexion, and a swollen state of her features, the hands and feet appear to be œdematous, but do not pit on pressure. The speech is slow and there is a lack both of bodily and mental energy.

The disease is *myxœdema.*

Females between thirty and fifty are the usual subjects of the malady, although it occasionally occurs in children. It has in some cases followed exophthalmic goitre. It comes on very insidiously, and there is great feebleness and inability for mental and bodily exertion before the characteristic appearances of the face and body show themselves. When the disease is fully developed, the cheeks are flushed, the skin pallid and unhealthy, the features coarse and swollen, presenting a striking resemblance to the aspect of one suffering from advanced kidney disease, excepting that the swollen parts do not pit on pressure. The skin is harsh and dry, the hair falls out, the teeth decay, and there is a remarkable slowness in the motions of the body and limbs. The temperature is subnormal. The speech is slow and hesitating, the memory defective, the patient listless and apathetic. The progress of the disease is slow, and the patient is often carried off by some acute affection or by phthisis. After death the thyroid is found to be in a state of atrophy or fibroid degeneration.

739. Myxœdema may be congenital, in which case the child is stunted, feeble, and defective both in body and in mind. A similar condition has been observed to follow operations for the removal of the thyroid body.

CHAPTER XVII

DISEASES OF THE SKIN

740. You will probably find more difficulty in the diagnosis of diseases of the skin than of any other structure of the body. This arises chiefly from the number of different classifications that have been proposed, and the variety of names that have been bestowed upon the same complaint. In the present chapter the system of Willan and Bateman has been mainly followed, as it is that which is chiefly used in this country, and is also most easily remembered. You must bear in mind that an eruption may alter its appearance during its progress, and therefore you must be careful in any difficult case to inquire as to its condition in its early stages. If it is general, examine it in different parts of the body, for its characters may be altered by the friction of the clothing or other circumstances. In many instances the diagnosis requires you to ascertain if the eruption is contagious, or has been produced by a local irritant. It is a good plan to make yourself familiar with the various forms of skin diseases, by means of coloured plates or wax-models, before you begin your observations on the living subject, so that you may more readily seize on their distinctive characters when they come before you.

741. When inflammation attacks the skin, a greater variety of morbid appearances is produced than when it affects the mucous membranes or other parts of the body. These appearances serve as a means of classification, and it is therefore necessary that they should be carefully studied.

742. The following definitions are taken from Willan and Bateman :

"*Papula* (*Pimple*) : a very small and acuminated elevation of the cuticle with an inflamed base, very seldom containing a fluid, or suppurating, and commonly terminating in scurf. *Vesicula* (*Vesicle*) : a small orbicular elevation of the cuticle, containing lymph, which is sometimes clear and colourless, but often opaque, and whitish or pearl-coloured. It is succeeded either by scurf or by a laminated scab. *Pustula* (*Pustule*) : an elevation of the cuticle, with an inflamed base, containing pus. *Tuberculum* (*Tubercle*) : a small, hard, superficial tumour, circumscribed and permanent, or suppurating partially. *Bulla* (*Bleb*) : a large portion of the cuticle detached from the skin by the interposition of a transparent watery fluid." In all the above, small portions of the skin are raised above the surface, and you will observe that the papula differs from the tubercle, and the vesicle from the bleb only in size. "*Exanthemata* (*Rashes*) : superficial red patches, variously figured, and diffused irregularly over the body, leaving interstices of a natural colour, and terminating in cuticular exfoliations. *Squama* (*Scale*) : a lamina of morbid cuticle, hard, thickened, whitish, and opaque. *Macula* (*Spot*) : a permanent discoloration of some portion of the skin, often with a change of its texture."

743. Besides the above alterations in the appearance of the skin, each separate structure of which it is composed is liable to disease. The papillæ are greatly increased in size in warts and corns, the appearance of which it is unnecessary to describe. *Warts* are enlargements of the papillæ, each one of which contains a loop of blood-vessels and also nerves. *Corns* are of the same nature as warts, excepting that the epidermis covering them is greatly thickened by pressure.

744. The secretion is not infrequently retained in the sebaceous follicles, and the surface often becomes covered with dirt, which forms a black spot on the skin. The secretion can be readily squeezed out, and looks like a little grub.

If the little tumour thus formed is uninflamed it is termed a *comedo;* if inflamed it is named *acne.* When the secretion is not confined to the excretory ducts, but distends the sebaceous glands themselves, a little tumour is produced, called *Molluscum.* A minute animalcule, varying usually from $\frac{1}{130}$th to $\frac{1}{80}$th of an inch in length, is often met with in the sebaceous follicles (*Acarus folliculorum*). It lies lengthways in the follicle, with the head downwards, but it does not seem to give rise to irritation, as it is often met with in the skin of persons who are not liable to acne.

745. Authors describe *three* forms of vegetable parasites which present themselves in diseases of the skin; two of these are confined to the hair, the third is found on the surface of the skin. The best method of displaying these minute bodies is to extract a few hairs from the diseased part, or, in the case of *Pityriasis versicolor*, to scrape off a little of the epidermis. Place the object thus obtained on a clean slide, add a drop or two of liquor potassæ, cover it with a piece of thin glass, and examine it with a microscope having a quarter of an inch objective.

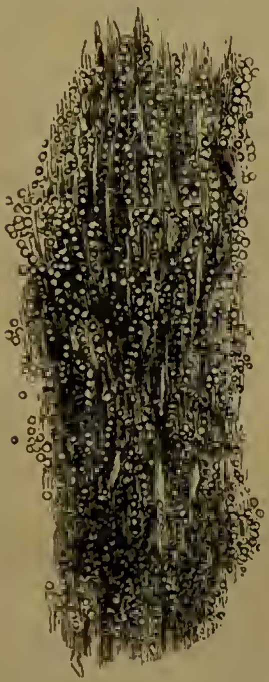
746. When the crust of *favus* is thus treated, a number of vegetable cells termed "spores," intermixed with a large amount of granular matter, are brought into view. The spores are oval or round, about $\frac{1}{3000}$th of an inch in diameter, are slightly constricted about the centre, and are mixed with numerous branching tubes, some of which are empty, some filled with granular matter, and which generally vary from $\frac{1}{4000}$th to $\frac{1}{15000}$th part of an inch in diameter. This parasite is named *Achorion Schönleinii*, and is seen in the substance of the hair itself.

747. The parasite in *Tinea tonsurans*, *Tinea circinata*, and, according to some authors, in *Sycosis*, presents the appearance of round or oval spores, about $\frac{1}{7000}$th of an inch in diameter, mostly isolated, but some also united in the form of chains. It is termed the *Tricophyton*, and differs from the *Achorion* chiefly in the smaller number of its tubes and the larger quantity of its spores (fig. 125).

748. The *Microsporon furfur* is found on the patches of skin affected with *Pityriasis versicolor.* It presents a number of spores of considerable size collected into clusters like bunches of grapes, intermixed with numerous branching tubes (fig. 126).

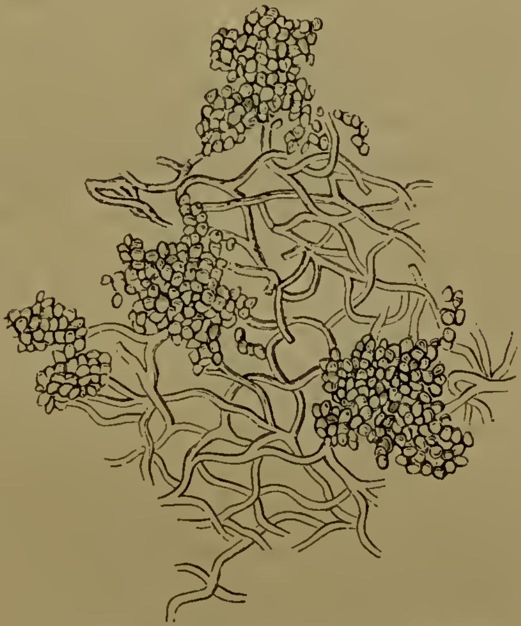
749. *Pediculi* (lice) are common causes of irritation of the skin. Three varieties are mentioned which differ in appearance—viz., *Pediculus capitis*, *Pediculus pubis*, and *Pediculus corporis.* The latter of these is a frequent cause of prurigo in old persons. The insects and their ova should be carefully searched for in the folds of the clothes worn next the skin (fig. 127). Pediculus capitis is often associated with eruptions on the head in children.

FIG. 125.



Hairs from a case of Tinea tonsurans loaded with spores. (M'CALL ANDERSON.)

FIG. 126.



Spores and tubes of the Microsporon furfur from a case of Pityriasis versicolor. (M'CALL ANDERSON.)

750. The *Acarus scabiei* is the cause of scabies or itch. In this disorder furrows (*cuniculi*) can be often detected,

which are formed by the insects. "Before endeavouring to detect the cuniculi it is often useful to make the patient wash the part, especially if the skin is dirty. A minute whitish elevation can then be seen at the extremity of each, which is, in effect, the insect itself covered by a thin layer of epidermis. It can be very readily removed by gently raising with a penknife the epidermic covering, and then inserting the point in the direction of the acarus,"* which can be examined by the microscope. In other cases you may obtain evidence of the presence of acari by a plan recommended by Dr. Hilton Fagge. A piece of the scab must be boiled in a solution of caustic soda (ʒss to ℥j of water) until it is dissolved. Pour the fluid into a conical glass, suck up the deposit with a dipping tube, and place it on a clean slide for microscopic examination. The full-grown acarus has eight legs, a round body, and a projecting head (fig. 128). The female is larger than the male, and varies from $\frac{1}{7}$th to $\frac{1}{4}$th of a line in length. The eggs, which are usually found in the furrows, are about $\frac{1}{25}$th of a line broad, and $\frac{1}{11}$th of a line long.

751. If the scalp or other part thickly covered with hair be the seat of the disease, pass on to (790). If the skin presents simply a change of colour, unaccompanied by pain, itching, heat, or swelling, pass on to (789). If the eruption is accompanied by signs of inflammation, or by pain, or itching, begin at (752). Increased production of epidermis and thickening of the skin are here assumed to arise from inflammation.

SECTION I

THE ERUPTION IS ACCOMPANIED BY INFLAMMATION, PAIN, OR ITCHING

752. First observe if there are any hard, solid projections of the skin (tubercles), and ascertain if these were present

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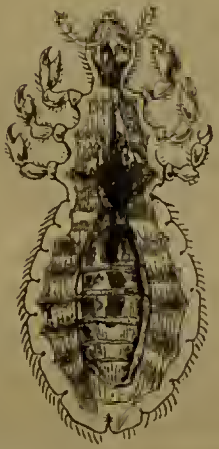
* Anderson, "On Skin Diseases."

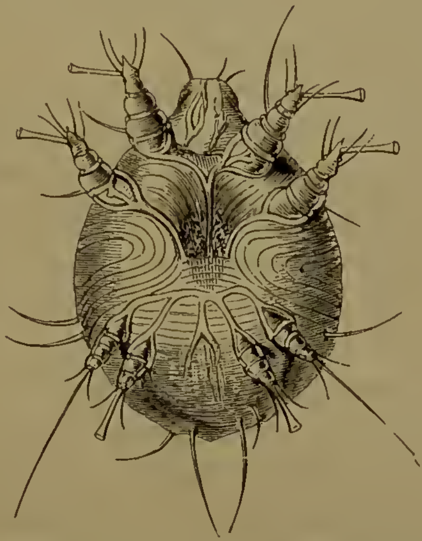
at the commencement of the complaint, and if so, pass on to (786). If such is not the case, remark if the eruption is dry or moist. If it has existed for some time you may have to determine this point by the previous history of the case, and by observing if the part presents scabs or scales on its surface. Remember that scabs result from the drying up of serous, purulent, or bloody secretions, whilst scales are produced by an increased formation of epidermis. If the complaint is of a dry character, begin at (753); if it is, or has been, attended with a fluid secretion, pass on to (770).

FIG. 127.



Pediculus corporis (female). (M'CALL ANDERSON.)

FIG. 128.



Male Acarus. (M'CALL ANDERSON.)

753. **A. The eruption is of a dry character.**

Under this head you may have the PAPULAR, SCALY, or EXANTHEMATOUS forms of disease; each of these is again subdivided into three orders. Observe if the skin is raised into papules, and if so, begin at (754). If this is not the case, see if there is an increased formation of epidermis

(758); otherwise pass on to (764). Remember that papular diseases are often followed by a scurfy condition; you distinguish them from the squamous affections by the total absence in the latter of any pimples.

754. *a. The eruption is papular.*

You may have three diseases under this head—lichen, prurigo and scabies (777).

755. *a. a.* The eruption consists of a number of minute pimples, generally of a red colour, sometimes separate, at other times grouped together, and attended with itching of a tingling character.

The disease is *lichen.*

The complaint sometimes commences with slight fever, and lasts only for a week or ten days, but usually it runs a more chronic course. It ordinarily affects the parts where the skin is thickest, as the back of the forearms and hands, and the outside of the thigh and leg. When lichen occurs in children it is named *Strophulus*, and is often dependent on teething or derangement of the digestion.

Lichen is distinguished from scabies by the latter presenting vesicles as well as papules, by the eruption being situated where the skin is thin, as between the fingers, and by the discovery of the acari or their eggs. From eczema by the edges of the patches of lichen showing papules, not vesicles, by the skin being thicker, rough and harsh, and not having the yellow crusts of the former.

756. *b. b.* The eruption presents scattered and rather flattened papulæ, scarcely differing in colour from the surrounding skin, but usually covered with a small black scab. The skin is generally thickened, flabby and dirty-looking. The itching is intense, and is increased by warmth.

The disease is *prurigo.*

At the commencement of the complaint few papules may be present and itching is the prominent symptom. The black scabs on the pimples are produced by scratching. The parts chiefly liable to prurigo are the outer parts of the limbs, the neck, chest, back, anus and genital organs.

The chief varieties of the disease are—

P. mitis.—In which the itching is tolerably slight.

P. formicans.—The itching severe and accompanied by stinging and pricking.

P. senilis.—When it occurs in old persons.

Prurigo is also named according to the locality affected; thus *P. podicis*, when the neighbourhood of the anus is attacked; *P. pudendi* and *P. scroti*, when the female or male genital organs are the seats of the disease.

757. In a large number of instances, especially in old persons, the prurigo is produced by the irritation set up by lice. This is especially the case when the eruption is confined to the neck, back and shoulders. In all doubtful cases examine the clothes for the insect or its eggs (fig. 127).

b. The eruption is of a scaly character.

Under this head you have also three forms of disease—viz., psoriasis, ichthyosis and pityriasis. Ascertain, by gently pinching up a fold of the affected part, if the cutis is thickened; if so, the case is one either of psoriasis or ichthyosis; if the complaint is entirely superficial, it is pityriasis.

758. *a. a.* The eruption consists of elevated patches of dry white epidermis. When the scales are removed the cutis below them is found to be slightly raised, somewhat thickened and of a red colour. Chaps often occur when the complaint affects the hands, feet, or other parts liable to constant motion. The itching is slight.

The disease is *psoriasis.*

The term *lepra* used to be applied to those cases in which the eruption assumed a circular form, but it is now seldom employed. Psoriasis commences in the form of small elevations of the skin capped by a thick layer of epidermic scales; these gradually extend, mostly in a circular shape. The disease usually attacks persons in good health, and is often hereditary.

The chief varieties are named from the shape of the patches, or according to the part affected; thus—

P. guttata.—The spots like drops of mortar.

P. diffusa.—When a large portion of skin is involved.

P. capitis.—When the scalp is attacked.

P. palmaris.—When it affects the palm of the hand.

759. Psoriasis is generally found just below the elbows and knees; when the palm of the hand or the sole of the foot is alone affected, the disease is almost always of a syphilitic character. When the scalp is the seat of the disorder, you may confound it with eczema; but in the latter the hairs are glued together by the dried secretion, which is not the case in psoriasis.

760. *b. b.* The *whole* skin of the part affected is covered with a dry, hard, thick, almost horny epidermis, which is irregularly elevated, being either raised into prominences, or showing the natural divisions of the skin. If the cuticle is removed, there is no redness of the skin beneath. The complaint is not attended by pain or itching.

The disease is *ichthyosis.*

The name is derived from the resemblance of the skin to the skin of a fish. The disease seems to consist in an increased thickness and altered condition of the epidermis, and is sometimes accompanied by hypertrophy of the papillæ of the cutis. It is often hereditary and, in some cases, congenital. When general, it usually avoids the palms of the hands, the soles of the feet, and the axillæ; when local, it chiefly affects the legs and forearms near the elbows.

761. It is distinguished from psoriasis by its not occurring in patches, with healthy skin intervening between them, by the absence of decided exfoliation of the epidermis and redness of the cutis.

762. *c. c.* The part affected is covered by an increased formation of fine scales of epidermis, which are being constantly rubbed off in the shape of powder. The cutis is

not thickened. It is generally attended with a considerable amount of itching.

The disease is *pityriasis.*

Some authors look upon this disease as only a variety of erythema. It has received its name from the bran-like character of the scales.

The varieties are named from the part of the body affected; thus we have *P. capitis,* when the head is the seat of the disorder. *Pityriasis versicolor* is a disease depending upon the presence of a vegetable growth, the Microsporon furfur (fig. 126). It presents itself as an eruption of irregularly formed patches of a yellow-brown colour, from which scales that under the microscope display the vegetable growth can be easily removed by friction. It is chiefly met with on the trunk of the body, and is seldom attended by much itching.

763. Pityriasis on the scalp may form patches which in children may be mistaken for "ringworm" (793); but the circular shape, the elevation of the edges, and the microscopic characters of the hairs in the latter complaint will suffice to distinguish it.

c. *The disease is of an exanthematous character.*

764. The rashes attended with a considerable amount of fever have been already described (668). You meet with three forms of rash in which fever is absent, or of only moderate amount—roseola, erythema and urticaria. First remark if there are prominent smooth patches, redder or whiter than the surrounding skin (wheals) and attended with severe itching and tingling; if so, pass on to (769). If this is not the case, begin at (765).

765. *a. a.* The skin is covered with irregularly shaped patches of a more or less rose-red colour, slightly, if at all, elevated. The throat is sometimes similarly affected; there is often slight fever, and the rash is attended with itching or tingling.

The disease is *roseola.*

The eruption may affect the whole body, as in measles and scarlatina, or it may be limited to some particular part. It often appears in the course of other diseases, but does not influence their course or issue.

766. Roseola is most likely to be confounded with measles and scarlatina. It is distinguished from the former by the small amount of fever and the absence of catarrhal symptoms, by the uniformity of the redness and the deeper colour of the patches; from scarlatina, by the smaller amount of inflammation of the throat and the slight degree of fever with which it is accompanied.

767. *b. b.* Patches of the skin present a red colour that disappears under pressure. The parts are sometimes slightly elevated, and the complaint is often attended with heat or itching.

The disease is *erythema.*

Erythema differs from roseola in its being limited to a portion of the skin and in the absence of any fever.

The complaint has been described under different forms:

E. læve.—Eruption on the legs of dropsical persons.

E. fugax.—Patches suddenly appearing and disappearing.

E. intertrigo.—Eruption produced by the friction of adjacent parts of the body.

E. nodosum.—Elevated patches, chiefly over the shin-bones and arms, never on the body.

768. Erythema is distinguished from erysipelas by its having no tendency to spread, by the slight amount of swelling, heat and pain, the absence of fever and of vesication.

769. *c. c.* The patient is affected with round or oval, elongated, prominent patches of the skin, that present the appearance of being produced by nettles. They appear and disappear suddenly, can be often excited by scratching, are not followed by desquamation, and are accompanied by intense heat and itching.

The disease is *urticaria.*

It often arises from indigestion, and in some persons certain articles of diet quickly give rise to it.

770. **B. The eruption is of a moist character.**

The vesicular and pustular forms of inflammation of the skin are included under this head. To distinguish between these, remember that the contents of the latter are *from the first* purulent, for the fluid of vesicles, though at first clear, often becomes turbid as the disease progresses. If the eruption is vesicular, begin at (771); if pustular, pass on to (780).

771. *a. The eruption commences with vesicles.*

Under this head we have five orders—eczema, herpes, sudamina, scabies and pemphigus. Rupia, which often contains a clear fluid at first, and is therefore classed by many amongst vesicular diseases, is by others referred to the pustular group. Chicken-pox also presents a vesicular eruption, but is described amongst Fevers (681). If the vesicles exceed a fourpenny-piece in size, they are named bullæ; if the eruption is formed of such, pass on to (779).

772. *a. a.* The eruption consists of irregularly shaped patches of minute vesicles, usually not larger than a pin's head, which, on breaking, discharge a fluid that stiffens linen and dries up into thin yellow crusts. It is attended with pain, smarting or itching.

The disease is *eczema.*

No vesicles may be apparent; the disease is then recognised by the skin feeling thick when pinched up with the fingers, by the *starchy* nature of the discharge, the formation of thin yellow crusts, and the attendant itching. It is one of the most common eruptions, is often hereditary, and is sometimes associated with rheumatism, gastric affections, or bronchitis.

The chief varieties are :

E. simplex.—When the itching and inflammation are moderate.

E. rubrum.—A more inflammatory form of the disease; often on legs affected with varicose veins.

E. impetiginodes.—A combination of eczema and impetigo.

It is likewise named according to the part affected—*Eczema capitis*, &c.

773. Chronic eczema occasionally simulates psoriasis, but in such cases you observe that the scales are formed by the drying up of secretion, not, as in the latter, by an increased formation of dry epidermis. When it affects the scalp, it may be mistaken for pityriasis, but in the latter the surface has been dry from the commencement, and the hairs are not glued together.

774. *b. b.* The eruption is formed of a number of large vesicles, grouped together on an inflamed base; they go through successive stages of maturation and scabbing, and are not reproduced. It is attended with heat and smarting, and sometimes with severe pains of a neuralgic character.

The disease is *herpes*.

Herpes usually commences as a red patch, on which vesicles shortly form. In some cases the eruption is preceded, in others it is followed, by severe neuralgic pains, and it is usually seated over the course of a nerve, such as the frontal or one of the dorsal nerves.

The varieties are divided into a phlyctenoid and a circinate group. In the former the eruption presents no regularity of shape; in the latter it is more or less circular. *Herpes circinatus* is a parasitic disease, and will be described in the affections of the hair. In *Herpes zoster*, or *shingles*, the patches of spots are arranged in the form of a band around half of the body, or down one limb. *Herpes preputialis* has been often mistaken for syphilis.

775. Herpes differs from eczema in the localised nature of the patch, in the absence of the oozing of a starchy secretion, and in the vesicles not being reproduced.

776. *c. c.* The eruption is formed of scattered vesicles like little drops of water, which in three or four days shrivel and dry up. There is no irritation or itching.

The disease is *miliaria*.

When the vesicles are unattended by redness they are termed by many *sudamina;* when slightly inflamed, *miliaria.* The eruption occurs in febrile or other diseases in which perspirations are present, but it seems to have no effect on the progress of the complaint with which it is associated.

777. *d. d.* The eruption consists of vesicles intermixed with papules, and sometimes with pustules; it is situated where the skin is most thin, and is attended with excessive itching, increased when the body is warm. The *Acarus scabiei* or its ova can be discovered.

The disease is *scabies* (*the itch*).

As scabies is extremely contagious, whenever you suspect it to be present ascertain if other members of the same family have been attacked. The parts chiefly affected are the spaces between the fingers, the inner surfaces of the wrist, forearms, thighs, the lower parts of the abdomen, the penis in the male, and the nipples in the female. In children the buttocks and inner side of the feet are most often attacked. The face and head are scarcely ever affected.

778. The diseases most likely to be confounded with scabies are lichen, prurigo, and eczema. The peculiarity of situation, the evidence of contagion, and the discovery of the acari or their ova, are the most certain means of diagnosis. Lichen is distinguished by the essentially papular nature of its rash, by its occurring chiefly on the outside of the back, arms and thighs, and by the dry, rough state of the skin accompanying it. In prurigo the neck and shoulders are more often attacked, and the discovery of pediculi may perhaps be made. Eczema can be often traced to some local irritant, as sugar, lime, &c., and the rash is more simply vesicular than in scabies.

779. *e. e.* A number of small blisters (bullæ) appear upon a reddened surface. The fluid they contain is transparent or of a yellowish colour, and after being evacuated a thin crust or superficial ulceration remains. The blisters are often, but not always, attended with pain, heat, or itching.

The disease is *pemphigus.*

The chronic form of pemphigus was formerly termed *pompholyx*, but this name is now rarely employed. The blisters seldom attack the scalp, palms of the hands, or soles of the feet. The disease is usually divided into *acute* and *chronic*.

780. *b. The eruption commences with pustules.*

Under this head you have impetigo, ecthyma, acne, and rupia. Observe if the pustules are pointed and situated on a hard elevated base; if so, pass on to (784). If they are blebs, or covered by a thick conical scab, pass on to (785).

781. *a. a.* There is an eruption of small pustules, only slightly elevated, often in patches: the pus dries into a greenish-yellow, irregularly shaped scab or crust. No scar is left after healing. There is generally a sense of heat or itching.

The disease is *impetigo*.

By many persons impetigo is considered as a pustular form of eczema. A contagious form is known as *impetigo contagiosa*. Micrococci have been found in the fluid contained in the pustules.

782. *b. b.* The eruption consists of large, round, isolated pustules, situated on a hard, inflamed base. The pus dries up into thick brown scabs, which afterwards fall off and leave slight scars. There is often heat, tingling, or itching.

The disease is *ecthyma*.

Ecthyma is chiefly met with on the extremities, back and shoulders. In scabies, ecthymatous pustules are often formed on the hands and feet, but they are associated with vesicles, and acari can be generally discovered.

783. Ecthyma is distinguished from impetigo by the small size of the pustules in the latter, and by their not having a hard base.

784. *c. c.* The eruption consists of little, isolated, hard, conical projections of the skin, some suppurating at their summits, or covered with a scab; others red, hard, and tender. The eruption is confined to the face, neck, and shoulders.

The disease is *acne*.

Acne is seldom seen before puberty. It might be confounded with ecthyma, impetigo, and eczema. Ecthyma is known by its broad, flat, not pointed pustules, and is not interspersed with black points, as in acne. In impetigo the pustules are not hard and prominent. Eczema is distinguished by its vesicular appearance, its itching or burning sensation, and by its not being confined to the face and shoulders.

The varieties of acne are :

A. simplex.—Small black specks surrounded by slight inflammation.

A. indurata.—Hard, red elevations, with suppurating tops.

A. rosacea.—Red patches, often associated with enlarged veins.

785. *d. d.* Flattened blisters are formed, which contain at first a clear, afterwards a bloody or purulent fluid. Subsequently each is covered with a hard, dark-coloured scab, often conical, which conceals a more or less deep, unhealthy ulceration.

The disease is *rupia.*

Rupia is almost always the result of syphilis. The lower limbs, loins, and shoulders are most often attacked. It is distinguished from pemphigus by the flattening of the bullæ, the thickened crust, and the subsequent deep ulcerations, instead of the distended blisters, the scaly covering, and superficial ulcers of pemphigus.

786. **C. The eruption is of a tubercular character.**

Under this head you have acne (784), molluscum, and lupus. Warts and corns have been already noticed. Keloid, elephantiasis, and frambœsia are generally classed under this head.

787. *a.* A number of hard circular tumours, varying from the size of a split pea to that of a hazel-nut, are present on the skin. They generally have a black point or slight

depression on their summits, and are sometimes attached by a pedicle to the skin.

The disease is *molluscum.*

The varieties of molluscum are the following:

(*a*) Circular tumours about the size of peas, having a well-marked depression in the centre of each; occurring most commonly on the faces (or other exposed parts) of several children in a family, or on a baby's face and its nurse's breast at the same time. This is *Molluscum contagiosum.* If one of the little tumours be cut into and squeezed, a lobulated gland-like substance is seen. There is a tendency to spontaneous cure.

(*b*) A number of circular tumours of various sizes (from that of a walnut downwards) scattered all over the body and extremities, dotted on their surface with black spots, and giving a semi-fluctuating feeling to the fingers. This is *Molluscum fibrosum* (or *simplex* or *congenitale*). There is no tendency to spontaneous cure.

(*c*) In connection with the last, or occurring separately, you meet with tumours of various sizes consisting of pendulous portions of skin and cellular tissue hanging by longer or shorter slender stalks.

788. *b.* The eruption consists of red patches, on which are situated small, round, softish tubercles, which may be covered with a brownish scab, or may have given rise to ulcerations or white puckered scars.

The disease is *lupus.*

The disease is most generally met with on the face, and the ulcerations frequently produce great deformity by destroying portions of the nose, &c.

The varieties of lupus are:

L. erythematosus.—Irregularly shaped, red patches, with a smooth and glistening surface, ending in scars, but not in ulceration.

L. non-exedens.—Ends in scars, but not in ulceration.

L. exedens.—Gives rise to destructive ulceration and scars.

SECTION II

The Skin presents simply a Change in Colour without Fever or Signs of Inflammation

789. Under this head are ephelis (sunburn) and lentigo (freckles), which do not require description; also, pityriasis versicolor (762), purpura (734) and Addison's disease (727).

SECTION III

The Scalp, or other Parts thickly covered with Hair, is the Seat of the Eruption

790. The hairy parts of the body are liable to the various eruptions that have been before described; thus the scalp is often attacked by psoriasis, pityriasis, eczema, and impetigo. But they are also subject to parasitic affections, which must be carefully studied, on account of their frequency and importance. In every doubtful case the hairs must be examined by the microscope.

791. *a.* The part affected presents a number of bright yellow, dry, circular crusts, depressed in the centre, or an irregular mass of dry, sulphur-coloured crust. The hairs are dull and dry-looking, are readily pulled out, and under the microscope exhibit the *Achorion Schönleinii.* There is some itching, and a peculiar mouldy smell, like that of mice.

The disease is *Tinea favosa* (*favus*).

The disease commences as little yellow specks surrounding the roots of the hair; when it has continued for a length of time, patches of baldness are often produced by the destruction of the hair follicles.

There are three varieties of *Tinea favosa* :

Favus pilaris—When the hair is affected.

F. epidermidis.—When other parts of the skin are attacked.

F. unguium.—When the disease is in the nails.

792. Favus may be confounded with impetigo, but in the latter there are seldom patches of baldness, the colour of the hair is not altered, and the microscope fails to detect the vegetable parasite. Psoriasis may simulate favus, but in it there is no change in the hairs and no mouldy smell, and patches of scaly eruption are usually also present on the elbows and knees.

793. *b.* There are circular patches on the scalp, upon which the dull dry hair has been broken off, so as to project only a few lines above the surface, which is covered with fine, white, powdery scales. The hair and scurf, when examined with the microscope, show the *tricophyton* (fig. 125). There is usually itching at the commencement of the eruption.

The disease is *Tinea tonsurans* (*ringworm*).

794. Permanently bald patches may be the result of ringworm, but they are rare. When affecting the scalp it is almost confined to childhood. It may be confounded with *eczema impetiginodes*, but in the latter the patches are not circular, and the hairs are healthy, the itching is excessive, and an eruption of a similar kind may be found on other parts of the body.

The varieties of the complaint are:

Tinea tonsurans.—Affecting the scalp.

Tinea circinata (*Herpes circinatus*).—Ringworm of the trunk or extremities.

Tinea sycosis.—Affecting the beard, usually attended with pustules and tubercles.

795. *c.* There are round or oval patches of baldness where the hair is quite removed, or replaced by fine downy hairs. The skin is white, and there is but little itching.

The disease is *Alopecia areata* (*Porrigo decalvans*).

At first the skin is rather wrinkled and slightly reddened. The complaint is usually limited to the scalp, but may attack the eyebrows, beard, or genitals. It is believed by many to be the result of a vegetable parasite, but this is denied by others.

CHAPTER XVIII

ANIMAL PARASITES

A LARGE number of different animals are known occasionally to infest the human body, the majority selecting the alimentary canal for their habitation. These helminthic or worm-shaped parasites are arranged in three orders—the Cestoda, Trematoda, and the Nematoda.

SECTION I

CESTODA, OR TAPE-WORMS

796. The entozoa belonging to this order present themselves in the bodies of man and other animals in two different forms, one of these being the larval or immature condition of the other.

In the sexually mature state they are found in the small intestine. They are of an elongated, ribbon-like form, are composed of separate joints or segments, and, as every mature joint contains both male and female reproductive organs, each worm may be regarded rather as a chain or colony of individuals than as a single animal. They are destitute of mouth or alimentary canal, and probably exist by the absorption of the fluids in which they are immersed. The head is provided with suckers, accompanied in some species by hooklets, by which they are enabled to fix themselves to the mucous membrane of the intestines.

The growth of new segments takes place at the upper end of the worm below the head; and the lower, and therefore older, joints, as soon as the ova they contain become mature, separate, and are discharged along with the fæces.

When a ripe ovum of the ordinary tape-worm escapes from the intestinal canal, and gains an entrance, along with the food or drink, into the stomach of an animal fitted for its habitation, the embryo is set free by the digestion of its enveloping capsule. The "*proscolex*" as the embryo in this stage is termed, perforates the walls of the intestine by means of the spikelets with which it is furnished, and reaches some organ suitable for its abode. Here it is excluded from the air, becomes enclosed in a cyst, and a colony of individuals is produced. The "*scolex*," as each of these is termed, is furnished with a head provided with hooklets, and a neck which is attached to a vesicular body, containing fluid. In this condition it has no reproductive organs, and cannot be further developed, unless it is taken into the intestinal canal of a warm-blooded animal. The cysts of one species (*Tænia echinococcus*) constitute the hydatids so often met with in the human liver (280). Those of another species give rise to the disease, in the flesh of the pig and other domestic animals, named "measles."

The symptoms resulting from the presence of tape-worm in the intestines vary greatly. Some persons are unaware of the existence of the parasite until their notice is attracted to the fact of joints being passed with the fæces. Others complain of a feeling of faintness and a craving for food, flatulence, griping pains of the abdomen, irregular action of the bowels, irritation of the mouth or nose, and other signs of disordered digestion. More rarely, giddiness, headache, or even convulsions have been observed, especially in young persons.

There are eight varieties of this order found in the human body, but only two are of frequent occurrence in this country. These are the *Tænia solium* and the *Tænia mediocanellata*.

797. *a. Tænia solium.*—It inhabits the small intestines and attaches itself to the mucous membranes. It may attain the length of ten feet, and, although formerly supposed only to occur alone, two or three worms may exist together. The head is about the size of a small pin, and furnished with four suckers and a double row of hooklets, the neck is long and narrow (figs. 129, 130, and 131). The larval form is named the *Cysticercus tæniæ cellulosæ*, and constitutes the "measles" of the pig. In man the cysticercus is occasionally met with in the brain, the eye, and in the muscles. When it is present in the brain it may give rise to fatal consequences. The worm is apt to be developed in such persons as consume raw or underdone pork.

798. *b. Tænia mediocanellata.*—This is usually longer than the tænia solium, and its segments are larger and more numerous. The head has four suckers, but is devoid of hooklets. The larval form (*Cysticercus tæniæ mediocanellatæ*) infests the flesh of the ox, and the worm is consequently found in those who have partaken of raw or imperfectly cooked beef. It is common on the Continent, and was supposed, until the researches of Dr. Cobbold, to be rare in this country. It is now, however, believed to be as common in England as the former variety.

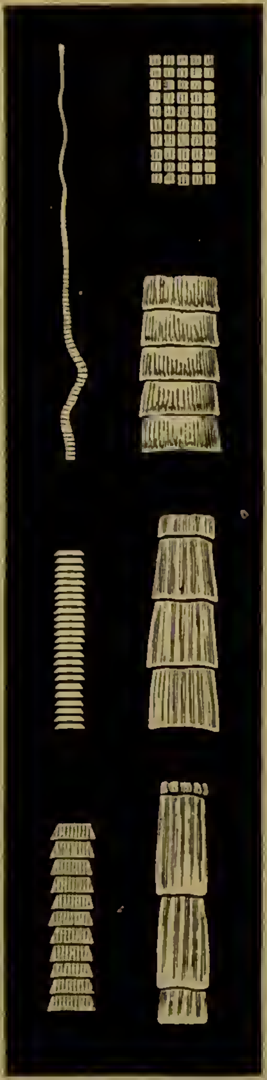
799. *c. Tænia elliptica.*—This only attains the length of six or eight inches. The head is very small, and furnished with hooklets. It exists in the intestines of the cat and dog, but has been rarely observed in the human subject. The larval condition is found in the lice and fleas of the dog.

800. *d. Tænia flavo punctata* scarcely reaches a foot in length. The joints in the anterior half of the chain are marked by a yellow spot. It has been only once found in the human subject. The larval condition is unknown.

801. *e. Tænia nana* is a very small worm, scarcely

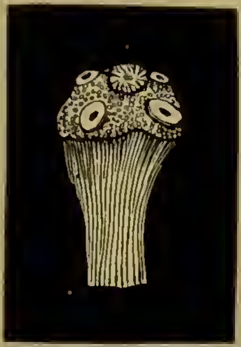
attaining an inch in length. The head is provided with hooklets and four suckers. It has been met with in the duodenum of the natives of Egypt. The larval condition is unknown.

FIG. 129.



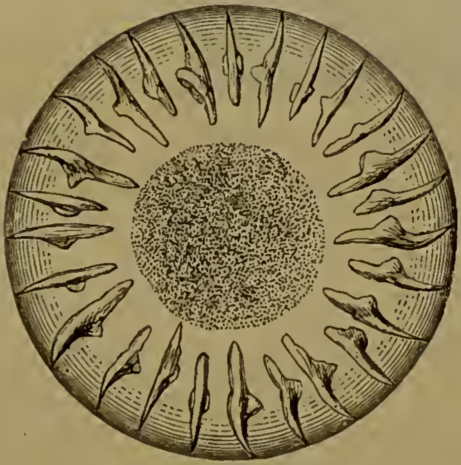
Tænia solium, showing the head and some of the segments at different distances—natural size. (DAVAINE.)

FIG. 130.



Head of the *Tænia solium* magnified, showing the four suckers and the hooklets. (DAVAINE.)

FIG. 131.

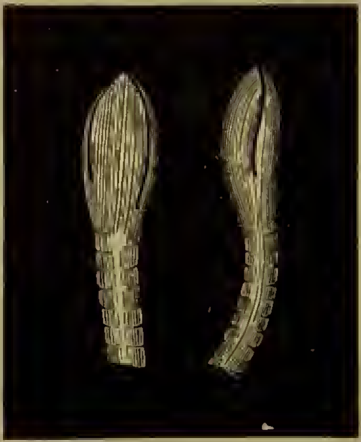


Microscopic appearance of the hooklets of the *Tænia solium*. (LEUCKART.)

802. *f. Tænia echinococcus.*—The mature worm consists of three or four joints, and is seldom longer than a quarter of an inch. The head is provided with hooklets. It occurs in the intestines of the dog, but has not been met with in man. In the larval condition it constitutes the hydatid so frequently found in the human subject, more especially in the liver (fig. 80).

803. *g. Bothriocephalus latus.*—This is the largest form of tape-worm known to infest the human subject. The head is club-shaped and unprovided with hooklets, but has a deeply-grooved longitudinal sucker on each side (fig. 132). The joints are broader than they are long. It is common in Switzerland, Russia, Sweden, Poland, and some other European countries. The ova are developed in water and the parasite is believed in the larval form to inhabit the bodies of certain fish.

FIG. 132.



Magnified view of the head of the *Bothriocephalus latus.* (DAVAINE.)

804. *h. Bothriocephalus cordatus* is of comparatively small size, and has only been recently discovered in some natives of Greenland. It is about a foot in length, and has been found in the intestines of the dog. The head is heart-shaped, short and broad, and the segments are distinct in the neck.

SECTION II

TREMATODA, OR FLUKE-LIKE PARASITES

805. The entozoa belonging to this order are small, flat-shaped, usually pointed at each end, and not divided into segments. They are provided with two sucking discs, one

situated at the mouth and the other on the abdomen. They possess a mouth and a bifurcating alimentary canal, but no anus. The alimentary canal is hollowed out in the substance of the body and is not surrounded by a peri-visceral cavity. The male and female reproductive organs exist in the same individual. The larvæ are often tailed, have no hooklets, are never cystic, and probably go through various changes in form before their admission into the digestive organs of the animal in which they attain their perfect development. Nine species have been discovered in man.

806. *a. Fasciola hepatica*, or *Distoma hepaticum.*—This has been rarely met with in the human subject, and only in the gall-bladder and ducts.

It is very common in the sheep, where it inhabits the gall-bladder and ducts and gives rise to the destructive disease termed the "rot." The worm varies from eight to fourteen lines in length and from two to six lines in breadth.

807. *b. Distoma crassum.*—Varies from one inch to three inches in length by five-eighths of an inch in breadth. It was discovered in the duodenum of a Lascar by Mr. Busk.

808. *c. Distoma lanceolatum.*—Is about one-third of an inch in length, by one line and a half in breadth. It is of a lanceolate form and has only twice been met with in man.

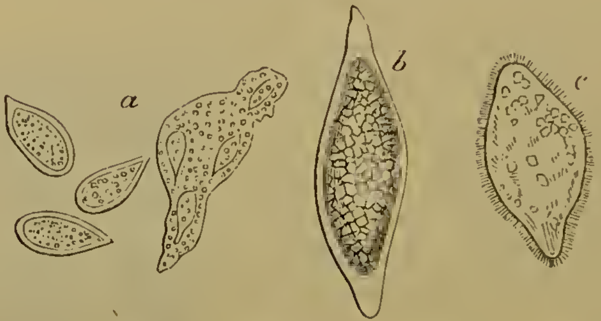
809. *d. Distoma ophthalmobium.*—Was found in the eye of a child affected with cataract. Of the four specimens discovered not one exceeded half a line in length.

810. *e. Distoma heterophyes.*—Was found in the intestine of a boy in Cairo. It did not exceed three-quarters of a line in length by a quarter of a line in breadth.

811. *f. Bilharzia hæmatobia.*—The male and female are separate, the latter, which is much the larger, being about four-fifths of an inch in length. It infests the human subject in Egypt and the Cape of Good Hope, and has been found in the veins of the mesentery, in the intestines,

bladder, ureters, and kidneys. By the irritation it produces, inflammation and hæmorrhage are set up in the organs it inhabits. When the intestines are the seat of the parasite, symptoms of dysentery are observed; when situated in the kidneys it produces a form of hæmaturia which is very prevalent amongst the inhabitants of certain parts of the Cape of Good Hope (249). The presence of the worm can only be detected by the discovery of the ova in the fæces or urine, by means of the microscope (fig. 133).

FIG. 133.



Eggs and embryos of *Bilharzia hæmatobia*. *a*. Three ova and a portion of mucous membrane with ova attached. *b*. Ovum further developed. *c*. Free embryo. (Dr. JOHN HARLEY.)

SECTION III

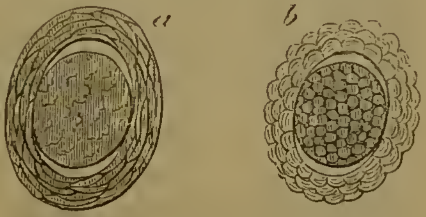
NEMATODA, OR ROUND WORMS

812. This order comprises a number of different families. The worms are slender, elongated, and not jointed. They possess a mouth, alimentary canal, and anus. They are unisexual, and most of them are parasitic during only a portion of their existence. The most important of this order are the following:

813. *a. Ascaris lumbricoides*, or *common roundworm.*—The body is of a reddish colour, tapers towards each extremity, varies in length from six to sixteen inches, and greatly resembles the ordinary earthworm in its general appearance. It has three distinct and uniform papillæ that surround the mouth, each of which is beset internally with microscopic teeth. It chiefly inhabits the small intestines, but may present itself in the stomach, œsophagus, or gall-ducts. It may be solitary or a large number may be present together. It commonly infests children or young persons.

In many cases no symptoms are produced by the presence of the worm in the intestines, but in others signs of intestinal irritation are observed. Thus, there may be occasional griping pains of the abdomen, irregular action of the bowels, variable appetite, itching of the nose or anus, restlessness at night, grinding of the teeth. The ova of the worm pass away with the fæces and can be generally discovered by microscopic examination (fig. 134).

FIG. 134.



Ova of *Ascaris lumbricoides* from the stools. *a.* Recently deposited. *b.* Longer delayed in the stools. (RANSOM.)

814. *b. Ascaris mystax.*—Is chiefly found in the cat, but has been proved to be occasionally present in the human subject. It varies from an inch and a half to two or three inches in length. Its head is spear-shaped.

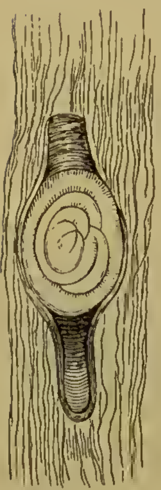
815. *c. Trichocephalus dispar.*—It varies from an inch and a half to two inches in length. Its anterior extremity is like a hair, and occupies two-thirds of its entire length; the posterior extremity is comparatively thick. The males are shorter than the females. It occurs chiefly in the cæcum and colon, but no symptoms have been recognised as resulting from it.

816. *d. Oxyuris vermicularis* or *thread-worm.*—This is a

small worm, like a piece of thread in shape. The female is about four-tenths of an inch in length, whilst the male is seldom more than one-sixth of an inch. The head is furnished with three lips, and is enlarged with wing-like attachments. It is most commonly met with in children and young persons, and infests the colon and the neighbouring part of the ileum. These worms are often present in great numbers, and are apt to creep out of the anus, especially at night.

817. *e. Trichina spiralis.*—This minute worm, which is only about one-eighteenth of an inch in length when mature, may exist in the human body in a free or encysted condition. In the encysted state it is situated between the sarcolemma of the primitive muscular fibres, and its capsule becomes more or less calcified (fig. 135). Thus enclosed it is sexually immature, gives rise to no symptoms, and is only discovered accidentally after death. It is often met with in the flesh of the pig, and if a piece of raw or imperfectly cooked pork thus affected be eaten, the encysted trichinæ are set free by the digestive process. In the intestines they increase in size, become sexually mature, and rapidly produce a numerous progeny. The young worms perforate the tissues, and enter the voluntary muscular fibres. They are most commonly met with in the intercostals and diaphragm; in the muscles of the limbs they are generally found near the junction of the muscle and its tendon. The symptoms occasionally are ushered in by violent diarrhœa and vomiting. More generally the patients complain at first of great depression of strength and pains of the limbs and muscles. These symptoms are quickly followed by hardness and rigidity of the muscles, great heat of skin, rapid pulse, thirst, and œdema of the face and limbs. When recovery

FIG. 135.



Magnified cyst of the *Trichina spiralis.* (VIRCHOW.)

occurs the trichinæ become encysted amongst the muscular fibres, and are incapable of further mischief.

818. *f. Filaria medinensis*, or *Dracunculus*, or *Guinea Worm.*—Although only about one-tenth of an inch in thickness, the parasite may attain the length of six feet. It may occur alone, or several may exist together. Only the female appears to occur in the human body, and the worm is confined to certain tropical regions of Africa and Asia. The embryos are believed to be contained in a minute crustacean that inhabits drinking water, and in this way they gain access to the digestive organs of man. After penetrating the tissues the parasite appears to remain quiescent for a period of about twelve months, during which time it has grown to a large size and become distended with young. It now makes its way to the surface, and a small blister forms over the part where it is about to make its exit. When this bursts the head of the worm appears, the young filariæ are discharged, and the parent is gradually ejected or is removed by art.

819. *g. Filaria lentis.*—Only attains the length of three-tenths to six-tenths of an inch. It has been found in the eye of the human subject.

820. *Filaria sanguinis hominis.*—The embryos of a minute nematoid worm, provisionally so named by its discoverer, Dr. T. Lewis, have been found in great numbers in the blood, and in the urine and other fluids of persons in India affected with chyluria (249), elephantiasis, or some other closely allied pathological condition. These average $\frac{1}{75}$th of an inch in length, with a transverse diameter of about $\frac{1}{3500}$th of an inch, and do not materially differ from the young of other nematodes, except in being enclosed in delicate transparent sheaths, within which they can be seen to contract themselves. The mature worm occupies one of the larger lymphatic trunks, and the embryos pass into the lymphatics and blood-vessels in the evening, but are absent during the day. They must, consequently, be sought for during the evening or the earlier hours of the night.

821. *h. Sclerostoma duodenale.*—Is about four to six lines in length. The head is round and provided with hooklets. It infests the small intestines, and is chiefly found in Egypt and in some parts of Italy. It occurs in large numbers, and is apt to produce a form of anæmia (*Egyptian chlorosis*), by the frequent small hæmorrhages it excites.

822. *i. Strongylus gigas.*—Is rare in the human subject, but is not uncommon in some of the lower animals.

823. *k. Strongylus bronchialis.*—Is six to nine lines in length, and has been found in the bronchial glands.

CHAPTER XIX

DISEASES OF RARE OCCURRENCE, OR WHICH ARE CONFINED TO TROPICAL CLIMATES

824. **Glanders** is a disease produced by infection from a horse suffering from the complaint, and is accordingly met with chiefly amongst grooms or coachmen. It may occur in an acute or chronic form. The incubation period is stated to be from three to five days. In the *acute disease*, if the infection has been communicated through an abrasion or by an injury, the wound assumes an unhealthy aspect, and becomes surrounded by an erysipelatous rash. The lymphatics of the part are inflamed, and present a knotted, cord-like, or irregularly nodulated condition—the so-called *farcy buds*. The patient suffers from pains in the head, limbs, and back, with great general weakness, but there is rarely much elevation of temperature at first. After a variable period of time, a pustular eruption makes its appearance upon the body, and gives rise to numerous deep ulcers of the skin. This is followed by inflammation and ulceration of the mucous membrane of the nose, accompanied by a muco-purulent or blood-stained discharge, and by swelling of the nose itself and the adjacent parts of the face. In some cases destruction of the septum or of the turbinate or palate bones may result. The conjunctivæ, the mucous membrane of the mouth, pharynx and tonsils, the larynx and bronchial tubes, are often affected to a serious extent. The temperature rises, the pulse becomes quick and weak, and death results from cardiac failure. The usual duration of the disease is about

sixteen days, and recovery is rare. The *bacillus mallei* has been found in the blood and tissues. In *chronic glanders* there is the same ulceration of the skin and inflammation of the nose, attended by fever and great weakness. The average duration of the complaint is about four months, and about fifty per cent. of the cases recover.

825. ANTHRAX OR MALIGNANT PUSTULE is occasionally communicated to man by one of the lower animals. It is chiefly found in those whose occupation is connected with the preparation of skins, hair or wool. It presents itself either as an external or an internal malady. Its incubation period may be only a few hours or it may extend to several days.

The *external variety*, or "malignant pustule," commences as a small, red pimple upon the hand, neck or face. This soon develops into a large papule, upon the surface of which several vesicles make their appearance. The blebs burst, give exit to a thin fluid and leave a gangrenous base which rapidly enlarges. Eventually the affected part presents a gangrenous ulcer, surrounded by a dusky, œdematous ring covered with vesicles. Accompanying the local manifestations there is considerable fever, great debility, thirst, and sometimes delirium. The characteristic bacilli can be found in the blood and in the discharges from the sore. In those cases where the carbuncular swelling is not fully developed, a diffuse cellulitis spreads from the seat of inoculation and is followed by suppuration of the tissues and of the glands.

In *internal anthrax*, or *wool-sorter's disease*, the first symptoms are a feeling of weakness and exhaustion, pains in the head and limbs, high fever, difficulty of breathing, with cyanosis, prostration and collapse. The exact phenomena vary according to whether the lungs or the gastro-intestinal tract are chiefly implicated. In the former case, cough, expectoration and dyspnœa, with the physical signs of bronchitis or pleuritic effusion are chiefly observed; in the latter, pains in the abdomen, nausea, vomiting, diarrhœa and great exhaustion are the prominent symptoms.

Death usually occurs within two to six days from the onset of the complaint.

826. Actinomycosis, or Ray-Fungus, is sometimes met with in man, and gives rise to inflammatory tumours in the jaws, tonsils, lungs, liver and other parts. When the disease affects the lungs it is accompanied by the symptoms and physical signs of phthisis, but the lower lobes rather than the apices are affected. In the liver it produces abscesses, which closely simulate the ordinary forms of hepatic abscess. The disease is usually of a chronic character, and almost always ends fatally. The only certain means of diagnosis is by the detection of the specific fungus in the discharges of the organ affected by the disease.

827. Beriberi.—There is a form of multiple neuritis which is common in the eastern part of Asia, Africa, India, Ceylon, and Brazil, and is known as *beriberi*. It occurs either along with general dropsy (the wet form), or without an excess of fluid (dry form). In both the patient first complains of general weakness, accompanied by loss of sensation in the front of the legs and at the tips of the fingers. There is tenderness on pressure over the muscles, which is followed by paralysis. The knee-jerks are lost. There is always marked anæmia; and palpitation and dyspnœa increased on exertion are usually prominent symptoms. Systolic murmurs are generally to be heard over the cardiac valves. In the *wet form* general dropsy makes its appearance, with effusion into the pleura and peritoneum. In the *dry form* there is wasting of the affected muscles and gradually increasing paralysis. Death may take place from anæmia, dropsical effusions, pulmonary œdema, or failure of the heart. The disease is supposed to arise from the presence of a micro-organism, but there is still some doubt as to its nature.

828. Yellow Fever.—This is an infectious fever that prevails as an epidemic chiefly in the tropical and insular

parts of America. It affects persons of all ages, and one attack confers an immunity from others. Its period of incubation is supposed to be about ten days, but there seems to be a considerable variation in this respect in different epidemics. The invasion is sudden, being attended by chills or a sensation of cold, rarely by rigors. This is quickly followed by a rise of temperature (103° to 105° or even 110°). The skin is hot, the face flushed, the eyes glistening, and the pulse quickened. The patient suffers from intense headache and pains in the back and limbs. The tongue is coated, there is great thirst; nausea and irritability of the stomach are usually present. There is tenderness over the epigastrium, the bowels are constipated, and the stools dark. The temperature usually falls in thirty-six or forty-eight hours, the pulse becomes slower, and the other symptoms are relieved. In *mild cases* slight jaundice may show itself, or convalescence may proceed unchecked. In *severe attacks* the patient again becomes restless, the temperature rises, but not to the same height as at first. The pulse becomes slow, the skin assumes a yellow colour, the urine is scanty, stained with bile, often albuminous, hæmorrhages take place from the nose, gums and other mucous membranes, and altered blood is often rejected from the stomach (*black vomit*). Low muttering delirium makes its appearance and the patient sinks from exhaustion. No micro-organism has been discovered to the action of which the disorder can be referred. The disease rarely lasts a week and many of those affected die on the third or fifth day after the commencement of the fever.

829. Dengue occurs as an epidemic disease in tropical countries. The period of incubation is about five or six days. Its invasion may be preceded by a general feeling of illness, but in most cases it is sudden. Severe pains and swelling of the joints are usually amongst the earliest symptoms, the finger joints being commonly the first attacked. The temperature rises rapidly and may reach

103° or 105°, the pulse is rapid, the breathing quickened, the tongue foul, the appetite lost, the bowels confined, the urine scanty, but not albuminous, and an eruption often shows itself on the face or some other part. In twenty-four or forty-eight hours the temperature falls suddenly with relief of all the symptoms, and in many cases it is attended by profuse sweating or diarrhœa. After an interval, that varies from a few hours to two or three days, the temperature again rises, and is followed by a rash which affects the whole body and resembles measles or scarlatina. The temperature gradually falls, the rash declines, and is followed by more or less desquamation of the skin. The disease seldom terminates fatally, and the usual duration is about eight days. The patient often remains for a length of time in very feeble condition, and the joints may be long in recovering their normal state.

830. Dengue may be mistaken for acute rheumatism or scarlatina. It is distinguished from rheumatism by the sudden elevation of temperature, the implication of the smaller joints only, by the sudden decline of the temperature and the presence of the characteristic rash. From scarlatina, by the affection of the joints in the early stage, and by the cessation of the fever before the appearance of the eruption.

831. Plague is a highly contagious disorder that at one time prevailed in Europe, but has for the last two centuries been confined to the East. Its period of incubation is believed to be about five or six days. The patient is suddenly attacked with severe headache, giddiness, often stupor, and pains in the back and limbs, followed by fever. The temperature usually varies from 102° to 104°, but it is in some cases much higher; there is great prostration of strength, often vomiting, and the bowels are confined. The tongue soon becomes dry and brown, and sordes collect upon the lips and teeth. About the second or third day buboes present themselves in the groins, axillæ, or neck, attended with severe pain. Petechiæ occur on the

skin, vomiting of blood or hæmorrhage from some of the other mucous membranes takes place, and boils or carbuncles appear on different parts of the body and limbs. If the patient survives long enough the buboes may suppurate. In favourable cases there is a sudden fall of the temperature, attended by profuse sweatings. The disease is, however, very fatal, and in those that recover, convalescence is tedious.

832. A form of the disease has been described (*abortive plague*) in which buboes form without fever or pain, and which terminates favourably in about fourteen days.

833. LEPROSY is a malady that in the Middle Ages was common in Europe, but which is now only general in certain countries of the East. It is said to be contagious, and probably results from the action of a bacillus, which has been isolated. The bacillus is very similar in appearance to the tubercle bacillus. The disease attacks both sexes and persons of every age.

The onset of the complaint is always slow and insidious. At first slightly raised erythematous patches form upon the skin, which afterwards fade, leaving the parts discoloured and slightly thickened. The mucous membranes of the mouth, nose and throat become affected. The voice is husky and eventually may be completely lost. Tubercles form on various parts of the skin, especially on the face and hands, and produce thickening and distortion of the features. Many of the tubercles ulcerate and leave deep, unhealthy sores. Along with these changes the nerves are usually implicated, and patches of the skin become anæsthetic. The ulna nerve is peculiarly liable to this change, and may be often felt enlarged and thickened just above the elbow joint.

The patient generally dies from exhaustion or from some co-existing affection of the lungs or kidneys.

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